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ANALYSIS OF THE EMISSIONS FROM STORAGE TANKS DURING JP-4 FUEL T--ETC(U)
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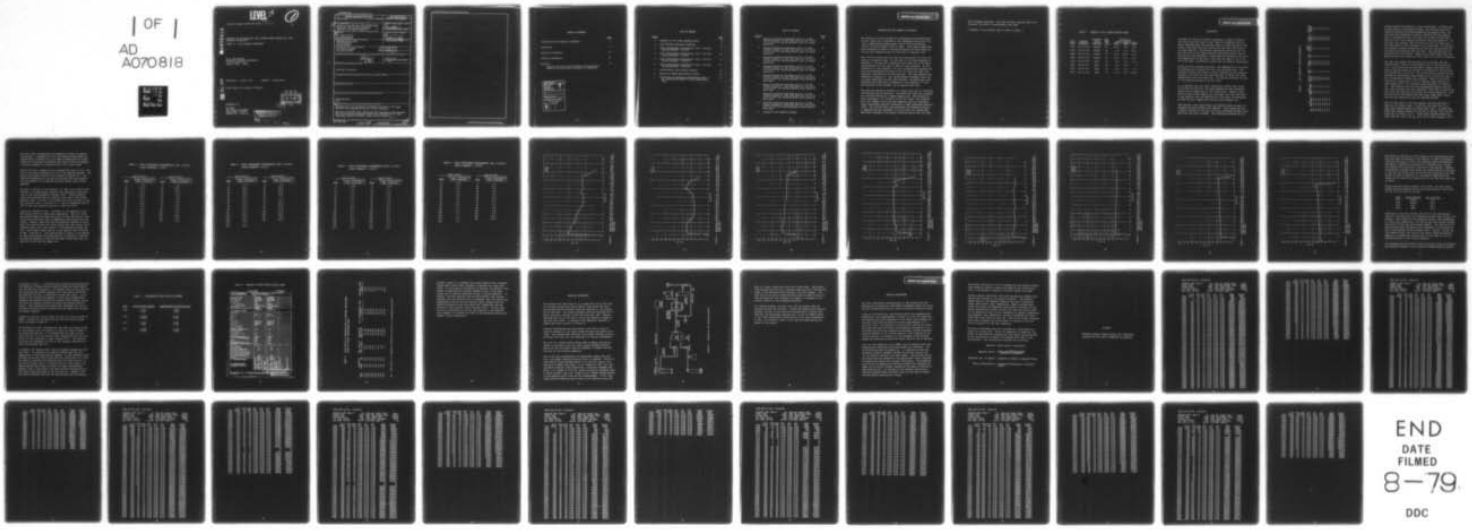

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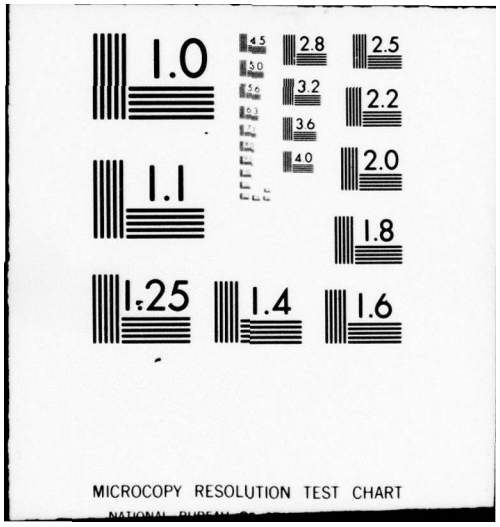
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LEVEL II

Phase I
AD69339

Contract Number F41608-78-C-1240

AD708818

ANALYSIS OF THE EMISSIONS FROM STORAGE TANKS DURING JP-4 FUEL TRANSFER OPERATIONS

PHASE II - COLD WEATHER CONDITIONS

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Submitted: 6 April 1979 Issued: 14 June 1979

Final Report for Phase II Testing

Prepared for

FB 2059
San Antonio ALC/SFQH
Kelly AFB, TX 78241
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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The objective of this program was to determine the amount of JP-4 vapor emitted to the atmosphere during fuel transfer operations.

Emissions from 50,000 gallon underground operating tanks at Wright-Patterson AFB, OH were measured by Monsanto Research Corp. and analyzed by a total hydrocarbon analyzer containing a flame ionization dector.

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INTRODUCTION AND SUMMARY OF RESULTS

The objective of this program is to determine the concentration of JP-4 vapor that is emitted to the atmosphere during the filling of underground storage tanks, during both warm weather (~85°F) and cold weather (40°F or less). This report summarizes data collected at Area C of Wright-Patterson Air Force Base during the cold weather portion of the study in February 1979.

Tank 275 was filled with JP-4 fuel and maintained in a full condition for several weeks. At the start of the test sequence on February 1, the fuel was transferred from Tank 275 to 273 while the emissions from the vent of Tank 273 were measured. At the completion of this transfer, the flow direction was reversed and fuel was transferred from Tank 273 to 275 while the vapor concentration emitted from 275 was measured. The test sequence was repeated on February 9. The vacuum-pressure breather valve was in normal operation for both test periods. Two additional test sequences were conducted on February 16 and February 27, with the pressure-vacuum breather valve manually held open.

The vent was partially enclosed in a Mylar film tent to eliminate wind effects and air dilution. The Mylar film tent was connected to a dilution device by a heated sample line. The dilution device, providing a 1:5 dilution of the vent vapor, was attached by a 1/4" copper line to the gas sampling valve of a portable total hydrocarbon analyzer containing a flame ionization detector (FID). The diluted vapor was burned and the detector provided a response that was recorded on a strip chart as a sharp peak. Data were recorded at two minute intervals during the 2-2½ hour

fuel transfer operation. The fuel flow was reversed and an additional 2-2½ hours of measurements were made.

A summary of the emission data is shown in Table 1.

TABLE 1. SUMMARY OF JP-4 VAPOR EMISSION DATA

1979 Date	Transfer Sequence	Breather Valve Position	Fuel Temp. (°F)	Emissions (Vol. % as CH_4) Avg.	Min.	Max.
2/01	275 to 273	Closed	44	11.0	8.8	15.9
2/01	273 to 275	Closed	44	8.0	6.3	10.2
2/09	275 to 273	Closed	44	13.8	12.9	15.4
2/09	273 to 275	Closed	44	12.4	11.2	13.1
2/16	275 to 273	Open	44	5.1	4.5	6.1
2/16	273 to 275	Open	44	6.4	5.8	7.0
2/27	275 to 273	Open	47	6.8	6.3	7.3
2/27	273 to 275	Open	47	9.3	8.4	10.8

DISCUSSION

A summary of the fuel transfer operations is shown in Table 2. The first four data lines in the table are concerned with the tests conducted with the breather valve in normal operating condition, while the last four provide the data with the valve in the open position. The ambient temperature was below 20°F for the first six of the eight transfer operations and for the remaining two runs the ambient temperature was between 34 and 41°F. The temperature of the fuel in the tank was found to be in the 44°-47°F range, considerably higher than the ambient temperature.

During the fuel transfer operation, the temperature of the vapor was measured as it exited the vent into the Mylar tent. The aluminum colored vents were in direct sunlight for the sampling periods on 2/9 and 2/27 and care was taken to shield the vapor thermocouple from the direct sun. The sky was overcast for most of the sampling periods on 2/1 and 2/16.

It is apparent from the vapor temperature results that during the filling of Tank 273, the vapor temperature was influenced mainly by the temperature of the liquid JP-4. However, when Tank 275 was filled, ambient air was drawn into this tank when it was emptied, and the temperature of the vapor is influenced by both the fuel temperature and the cooler ambient air.

The receiving tank liquid depth was measured prior to start of transfer and when transfer was complete. This figure was converted to gallons in the tank using the conversion factors available from the staff at WPAFB. The difference between the two

TABLE 2. FUEL TRANSFER OPERATION SEQUENCE

Date	Time		Tank Transfer Sequence		Breather Valve Position	Ambient Temp. °F	Barometric Pressure " Hg	Fuel Temp. °F	Average Vapor Temperature °F	Fuel Transferred (gal)	Flow Rate Calculated gal/min
	Start	Finish	From	To							
2/01	1332	1554	275	273	Closed	19	29.38	44	40	46469	327
2/01	1700	1904	273	275	Closed	16	29.40	44	32	46638	376
2/09	1308	1529	275	273	Closed	11	29.48	44	41	46594	330
2/09	1625	1831	273	275	Closed	10	29.53	44	35	46639	370
2/16	1122	1343	275	273	Open	18	29.53	44	38	46619	331
2/16	1440	1708	273	275	Open	18	29.58	44	30	46805	316
2/27	1053	1313	275	273	Open	34	29.33	47	43	46744	334
2/27	1422	1627	273	275	Open	41	29.32	47	44	46756	374

values provided the quantity of fuel transferred. As there were no flow meters in the pumping system, the flow rate was calculated by dividing the gallons pumped by the pumping time. The flow rate data presented in Table 1 indicate that the pumping rate in transferring fuel from Tank 275 to Tank 273 was lower than the rate in the opposite direction with one exception. The flow rate for transfer from 273 to 275 on 2/16 was lower than the flow rates for this transfer on all other days. On this day, the automatic shutoff system did not shut off the pump when the tank gauge indicated the tank was full. The pump was shut off manually after 148 minutes. Based on the other three runs, the system should have turned off after about 125 minutes of sampling.

The vapor was pumped from the Mylar tent enclosing the vent through about 6 feet of heated sample line to the dilution device. The dilution device contained a sample flow meter and a diluent gas flow meter to provide an indication of the dilution and variability of the flow. The actual dilution factor was determined by experimental measurements prior to each run using a high concentration methane gas standard. Typical flow rates through the system were 0.37-0.64 standard cubic feet/hour of vapor sample and 3.0-4.4 standard cubic feet/hour of dilution gas. The sampling flow rate was considerably smaller than the vent vapor emission rate and, therefore, there was no outside air drawn into the sampling tent during the filling operation. This was verified by the observation that vapor fumes were visible from the tent openings during the sampling periods.

Prior to the start of the test program, the fuel was held in Tank 275 for several weeks. After the first test day (2/1), eight days elapsed before the second test (2/9). An additional eight days elapsed between the 2nd day of testing (2/9) and the third day of testing (2/16). Eleven days elapsed between the third test day (2/16) and the final day of this sequence (2/27).

The JP-4 vapor concentration was measured in terms of methane equivalents. A calibration curve was prepared using known concentrations of methane in air in order to determine the linear range of the FID and to establish the dilution factor necessary to provide samples for analysis within this linear range.

Tables 3-6 list a summary of the concentration data in Vol. % as CH_4 at ten minute intervals for all of the sampling periods. The data at two minute intervals are plotted in Figures 1-8. The detailed information at two minute intervals for each sampling run is provided on the computer printout sheets given in the Appendix.

As shown in Tables 3-6 and Figures 1-8, there is a distinct difference in the hydrocarbon emission rate depending on the position of the vacuum-pressure breather valve. Higher emission rates were obtained when the breather valve was in the closed position (Feb. 1 and Feb. 9) than when the valve was held in the open position (Feb. 16 and Feb. 27). This is apparently the result of the tank pressure required to open the valve.

During the transfer on Feb. 2 and Feb. 9, the ambient air was much cooler than the liquid fuel temperature. Tank 273, which had remained empty for some time prior to each test period, contained air which would come to temperature equilibrium with the liquid. However, when this tank was emptied, outside air would enter the tank and this air, being cooler than the liquid, could condense some of the vapor before it was exhausted through the vent. This effect shows clearly in the emission data collected on Feb. 1 and Feb. 9. The concentration of vapor in the exhaust air was lower during the second portion of sampling in each day as would be expected if Tank 275 had been filled with cool outside air as the fuel was pumped out.

TABLE 3. TOTAL HYDROCARBON CONCENTRATION (VOL. % AS CH_4) DURING TRANSFER - 2/1/79

Tank 275-273		Tank 273-275	
Time	Actual Concentration (Vol. % as CH_4)	Time	Actual Concentration (Vol. % as CH_4)
0	0.6	0	1.6
10	15.5	10	10.1
20	15.0	20	10.1
30	13.6	30	9.6
40	12.9	40	7.6
50	12.1	50	6.8
60	11.0	60	6.3
70	10.0	70	6.5
80	9.0	80	6.8
90	9.0	90	7.2
100	10.2	100	8.5
110	9.5	110	10.2
120	9.5	120	9.5
130	9.5	124	9.5
140	9.5		
142	9.5		

TABLE 4. TOTAL HYDROCARBON CONCENTRATION (VOL. % AS CH_4) DURING TRANSFER - 2/9/79

Tank 275-273		Tank 273-275	
Time	Actual Concentration (Vol. % as CH_4)	Time	Actual Concentration (Vol. % as CH_4)
0	7.4	0	5.1
10	15.3	10	12.0
20	15.3	20	12.5
30	15.0	30	12.5
40	14.4	40	13.1
50	14.1	50	---
60	14.1	60	13.0
70	13.9	70	12.8
80	13.7	80	12.9
90	13.4	90	13.0
100	13.3	100	13.0
110	13.1	110	12.7
120	13.0	120	12.8
130	12.9	126	11.4
140	---		
141	12.9		

TABLE 5. TOTAL HYDROCARBON CONCENTRATION (VOL. % AS CH_4) DURING TRANSFER - 2/16/79

Tank 275-273		Tank 273-275	
Time	Actual Concentration (Vol. % as CH_4)	Time	Actual Concentration (Vol. % as CH_4)
0	0.05	0	0.04
10	5.8	10	---
20	5.3	20	6.6
30	4.9	30	6.8
40	4.8	40	6.6
50	5.0	50	6.6
60	5.1	60	6.5
70	4.6	70	6.3
80	5.0	80	6.3
90	5.3	90	6.2
100	5.1	100	6.1
110	5.4	110	6.1
120	4.9	120	6.1
130	4.6	130	6.0
140	4.6	140	6.1
141	4.6	148	6.1

TABLE 6. TOTAL HYDROCARBON CONCENTRATION (VOL. % AS CH_4) DURING TRANSFER - 2/27/79

Tank 275-273		Tank 273-275	
Time	Actual Concentration (Vol. % as CH_4)	Time	Actual Concentration (Vol. % as CH_4)
0	0.05	0	---
10	6.4	10	8.7
20	6.5	20	8.9
30	6.5	30	9.1
40	6.6	40	9.1
50	6.7	50	9.2
60	7.1	60	9.3
70	6.9	70	9.3
80	6.8	80	9.4
90	6.7	90	9.4
100	7.1	100	9.2
110	7.1	110	9.8
120	7.1	120	10.3
130	7.2	125	10.8
140	7.3		

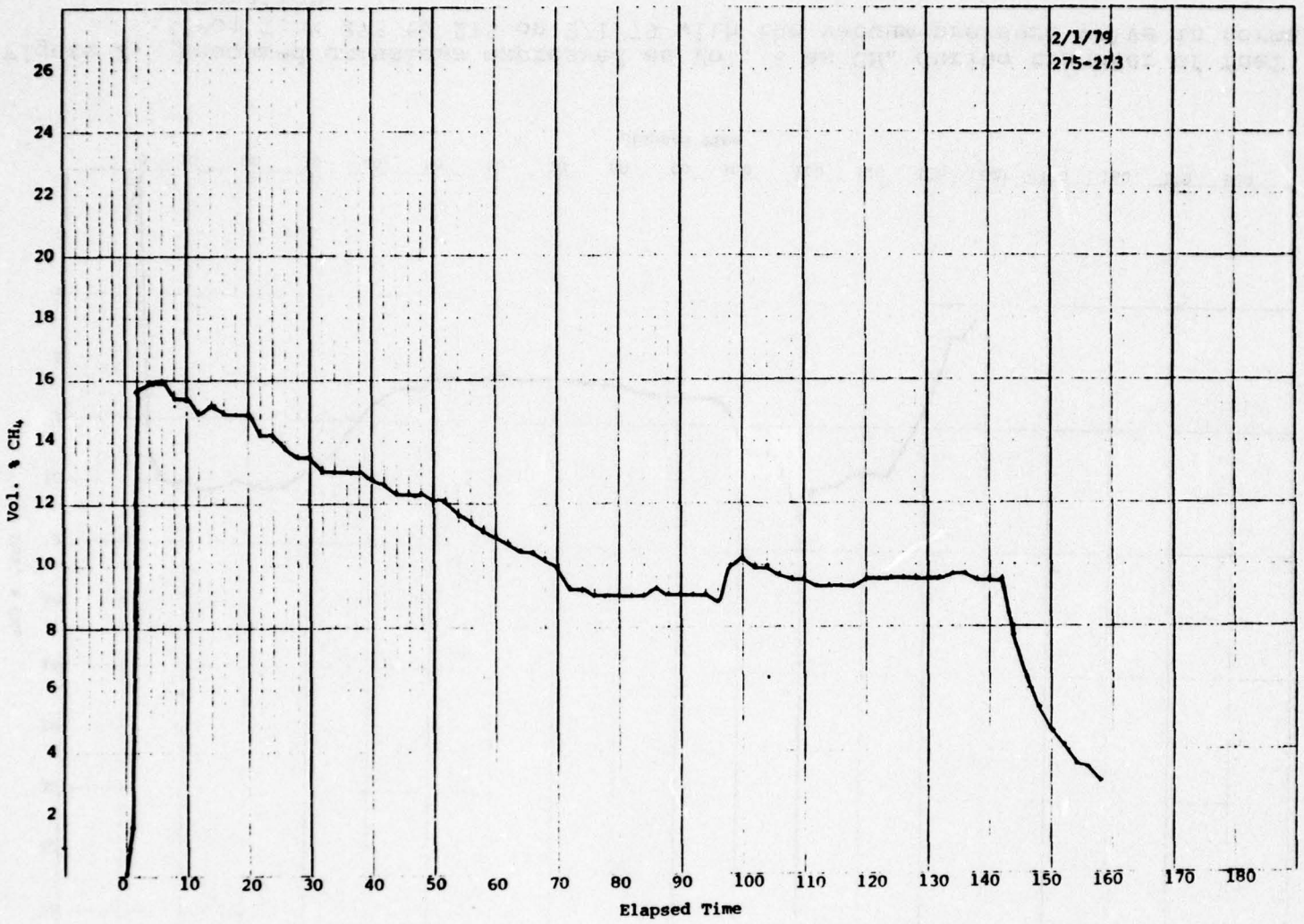

Figure 1. Measured emissions expressed as Vol. % as CH_4 during transfer of fuel from Tank 275 to 273 on 2/1/79 with the vacuum-pressure valve in normal operation.

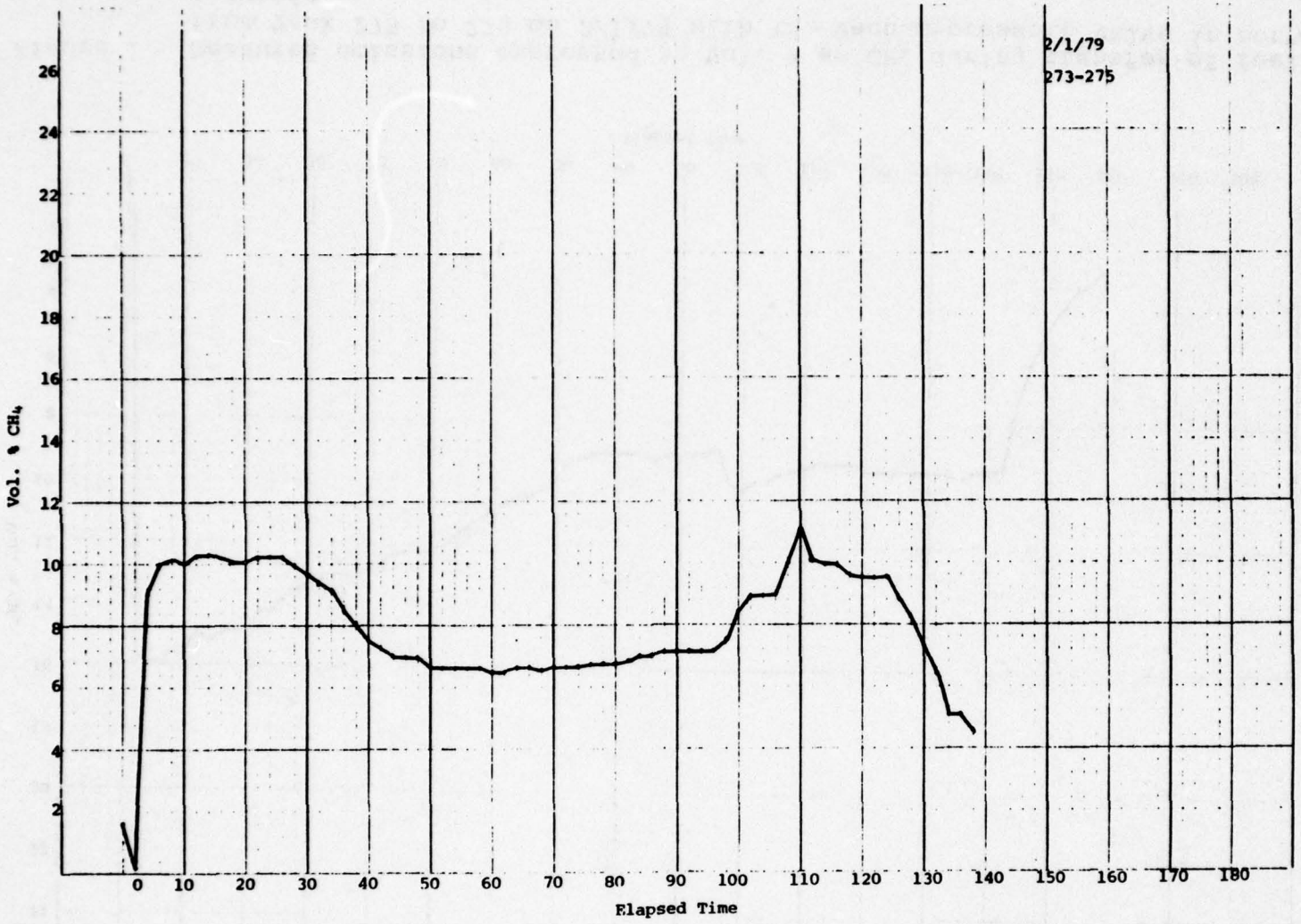

Figure 2. Measured emissions expressed as Vol. % as CH_4 during transfer of fuel from Tank 273 to 275 on 2/1/79 with the vacuum-pressure valve in normal operation.

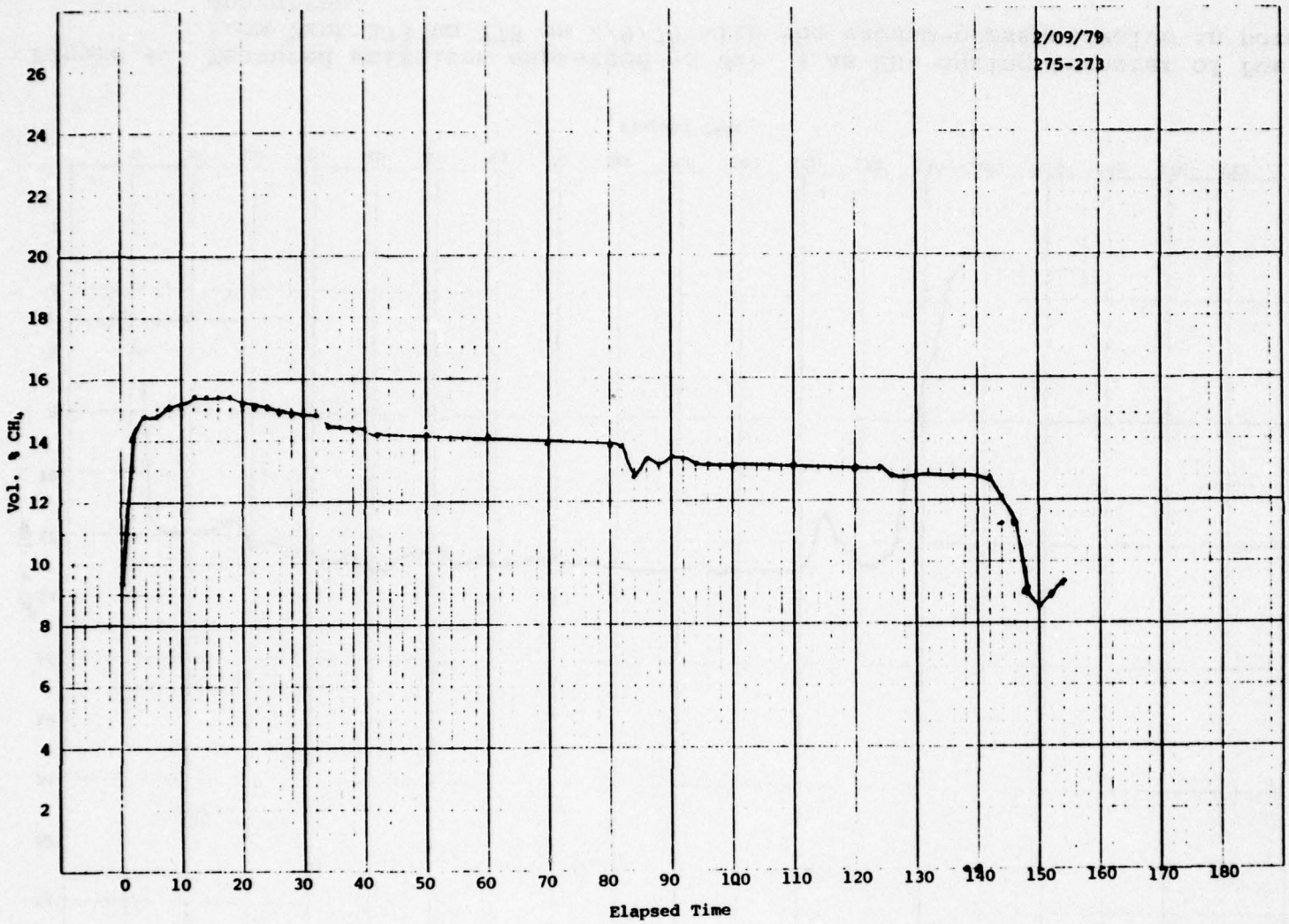

Figure 3. Measured emissions expressed as Vol. % as CH_4 during transfer of fuel from Tank 275 to 273 on 2/9/79 with the vacuum-pressure valve in normal operation.

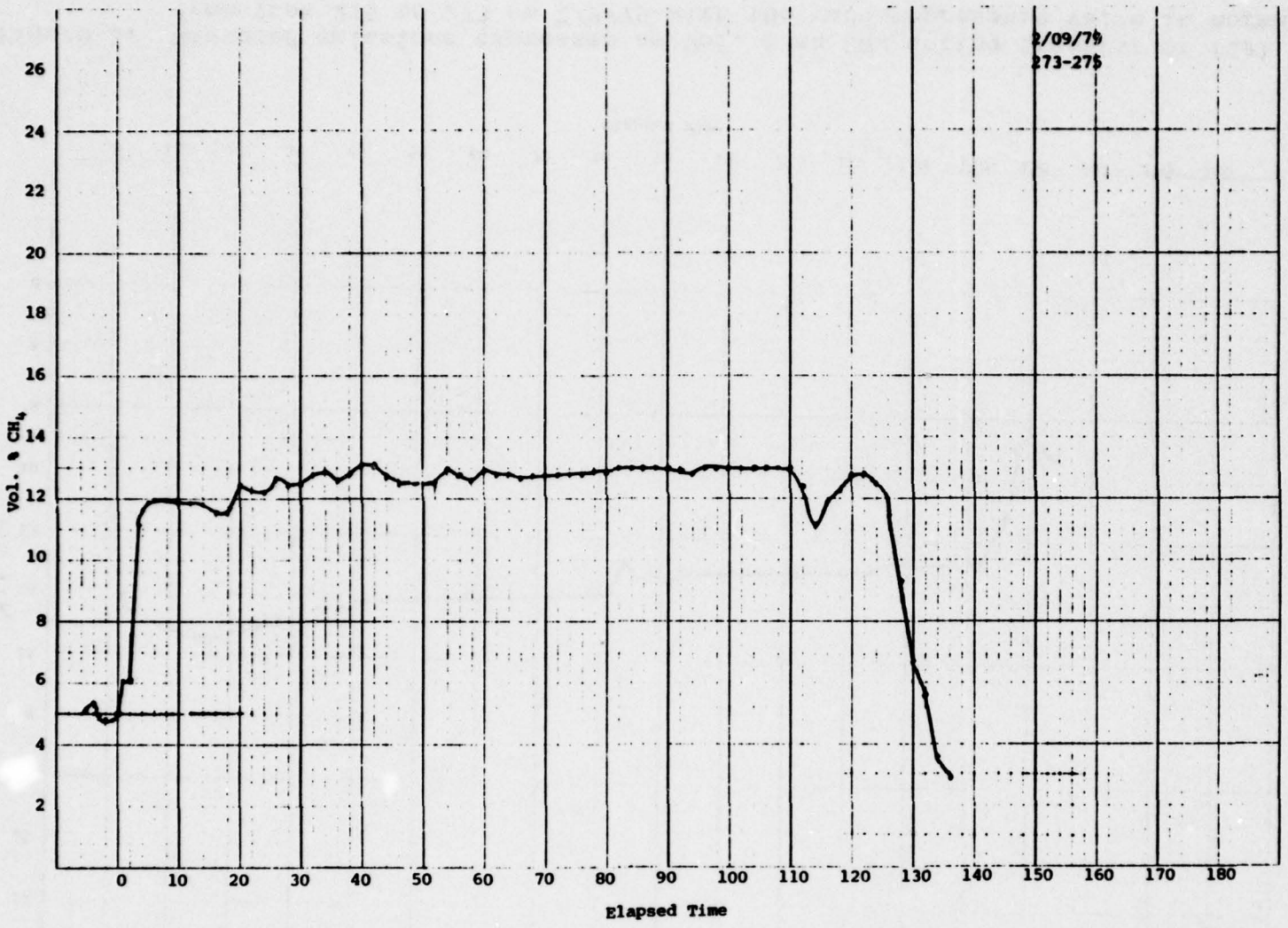

Figure 4. Measured emissions expressed as Vol. % as CH_4 during transfer of fuel from Tank 273 to 275 on 2/9/79 with the vacuum-pressure valve in normal operation.

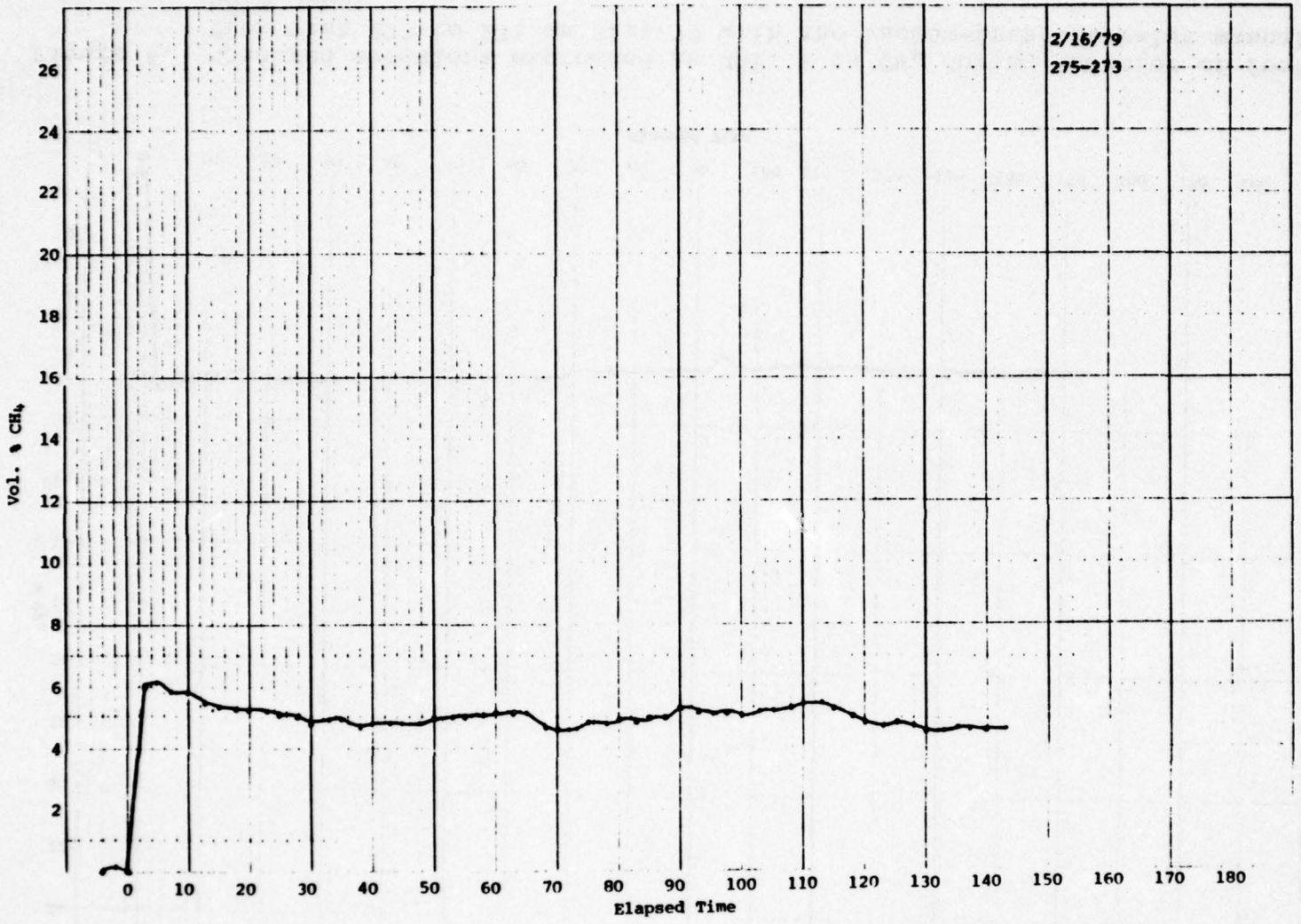

Figure 5. Measured emissions expressed as Vol. % as CH_4 during transfer of fuel from Tank 275 to 273 on 2/16/79 with the vacuum-pressure valve manually held open.

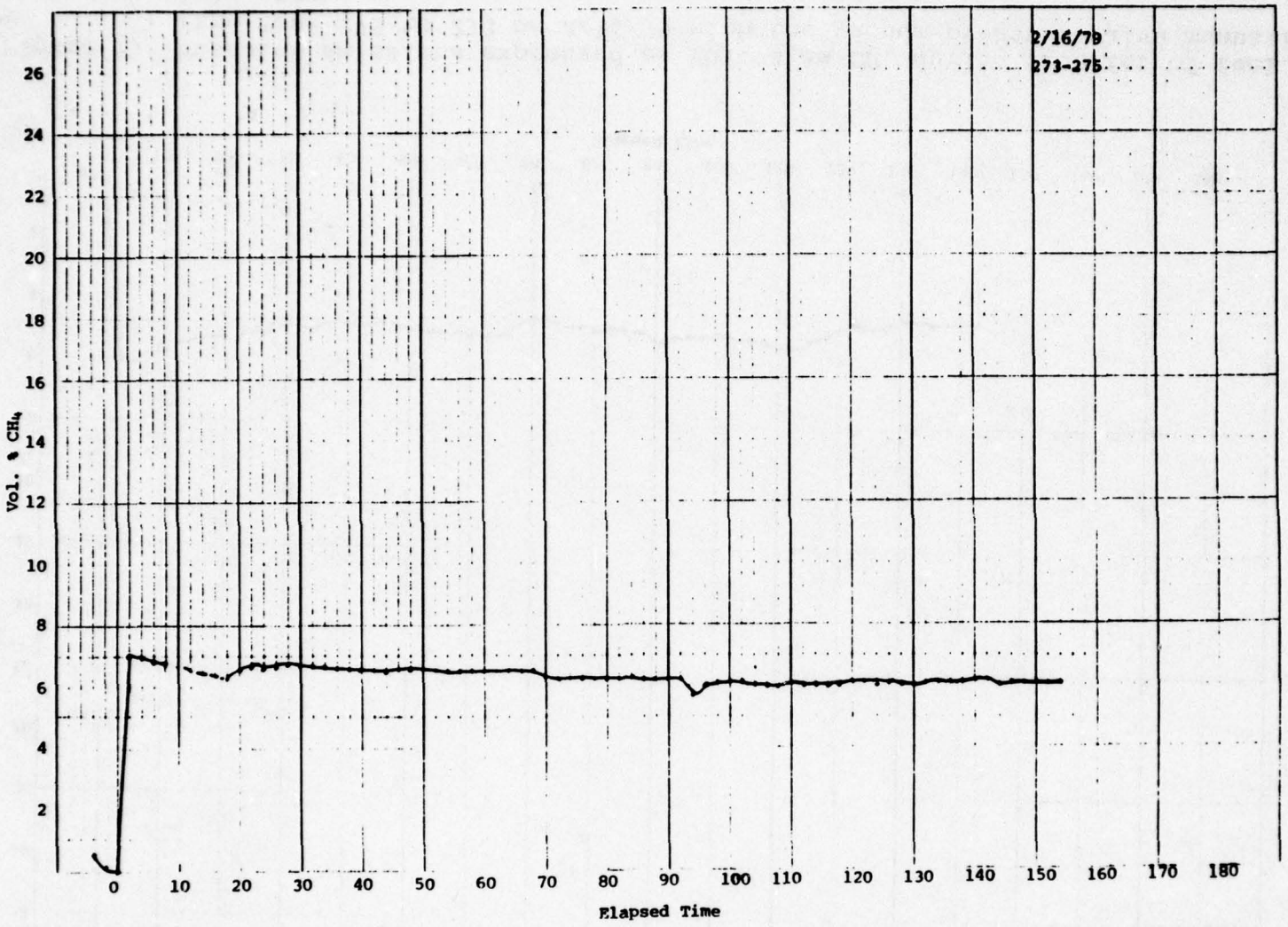

Figure 6. Measured emissions expressed as Vol. % as CH_4 during transfer of fuel from Tank 273 to 275 on 2/16/79 with the vacuum-pressure valve manually held open.

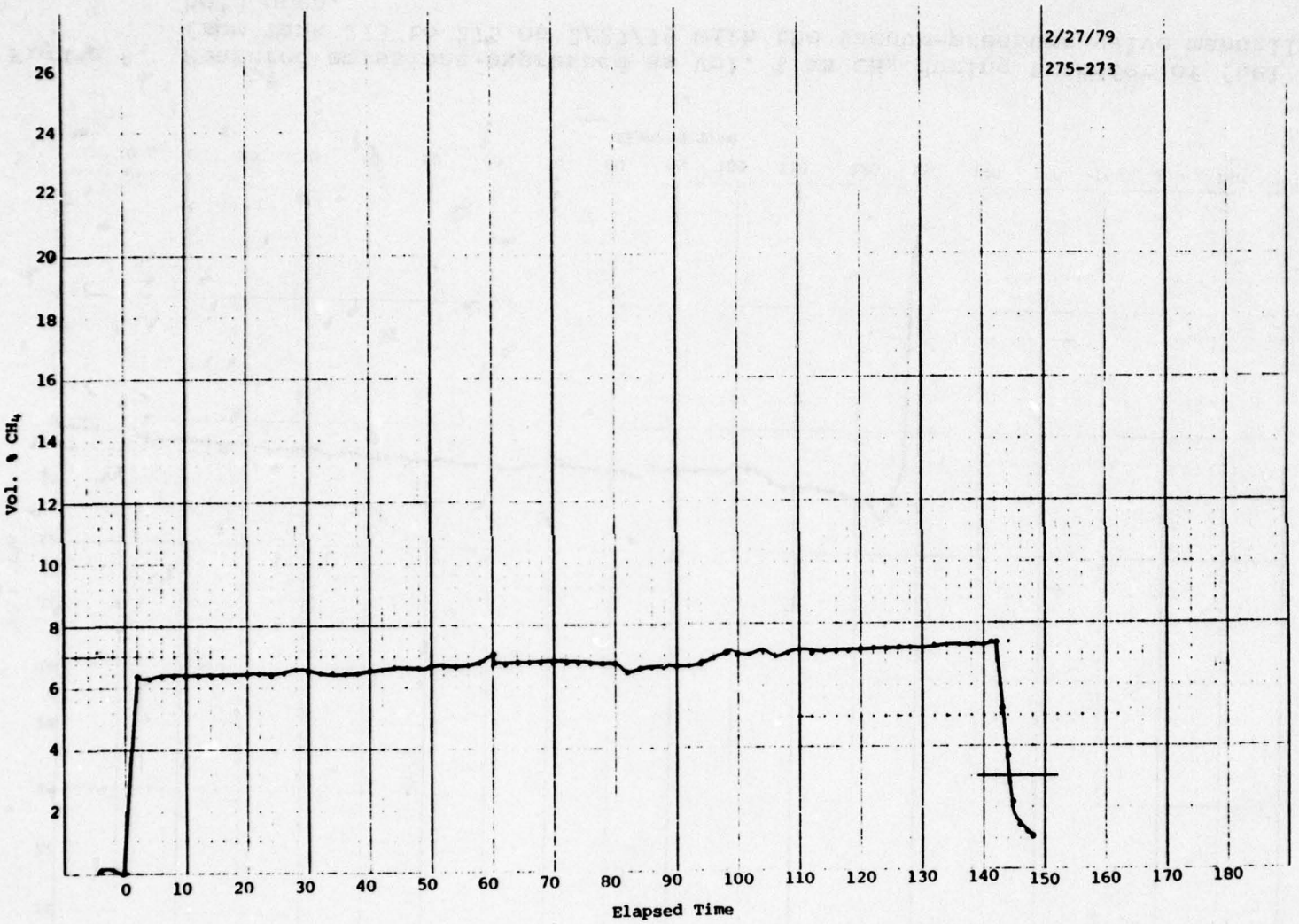

Figure 7. Measured emissions expressed as Vol. % as CH_4 during transfer of fuel from Tank 275 to 273 on 2/27/79 with the vacuum-pressure valve manually held open.

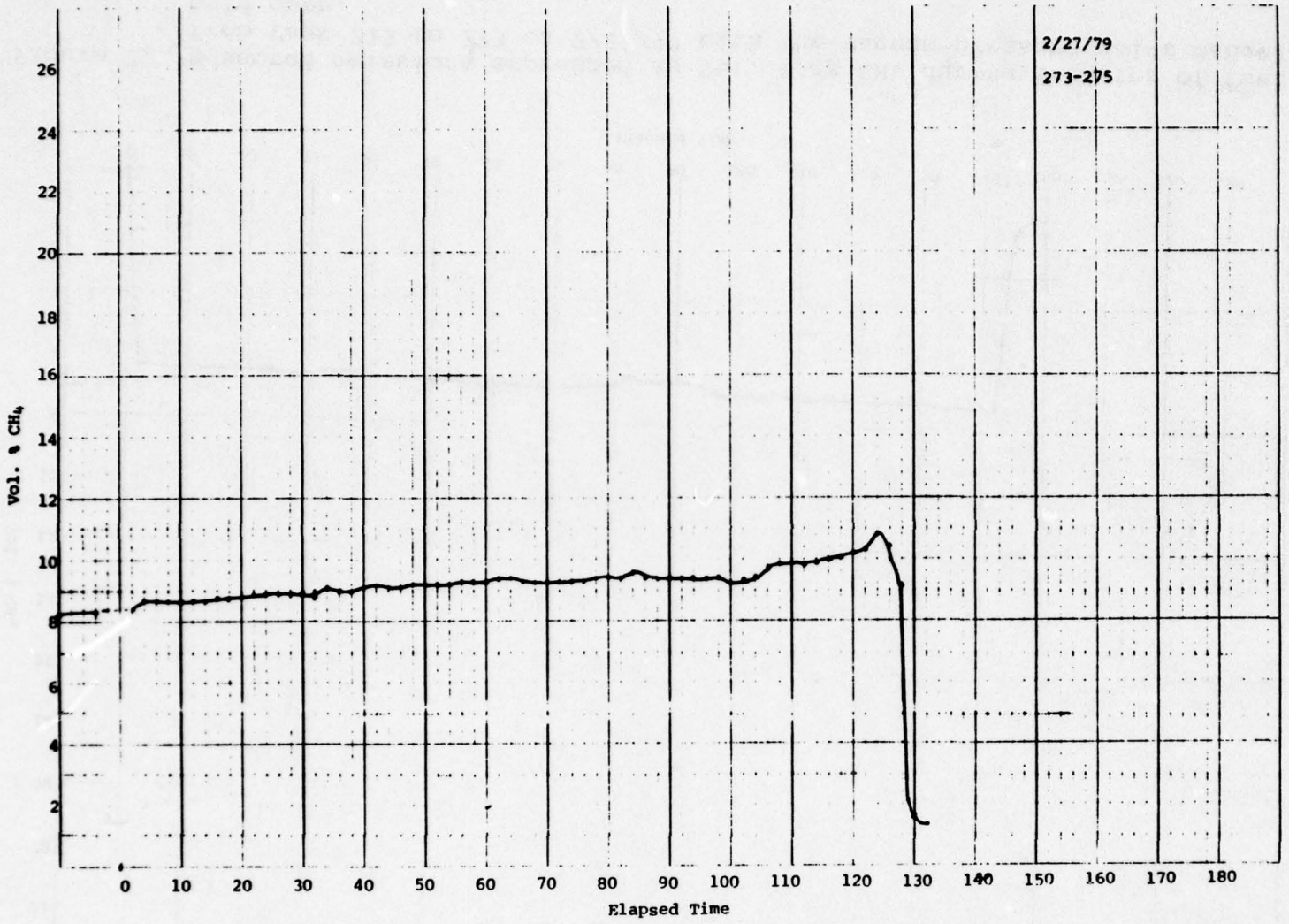

Figure 8. Measured emissions expressed as Vol. % as CH_4 during transfer of fuel from Tank 273 to 275 on 2/27/79 with the vacuum-pressure valve manually held open.

The effect of outside air is not shown by the concentration data from the tests on February 16 and February 27 when the breather valve was held open, in fact, the opposite effect was observed. The ambient temperature on February 16 averaged 18°F, so that cool ambient air would enter tank when it was emptied. However, the emissions concentration during the second portion of the test on that day was higher than during the first portion of the test. During the test on February 27, the ambient temperature was closer to the liquid fuel temperature, so that the air would have no effect.

During the warm weather portion of the study, the total hydrocarbon emissions measured during the first portion of the transfer for each day were as follows:

Date	Valve Position	Vol. % as CH_4
8/24	Closed	42.9
8/28	Closed	39.2
9/01	Open	38.7
9/08	Open	40.6

Comparison of the warm weather test data to the cold weather test data indicates that the emissions are much lower during cold weather. This effect would be expected based on the differences in liquid fuel temperature, 70°F during the warm weather program and 44-47°F during the cold weather program. The results of the warm weather tests indicated little difference in the emissions due to the pressure-vacuum breather valve. However, during the cold weather study, the valve in the normal operating position appears to increase the concentration of the vapor in the air exhausted during a fuel filling operation.

The concentration and dilution factors obtained from the standard gas mixtures (methane in air) during the WPAFB sampling periods

are shown in Table 7. Calibration gas mixtures were analyzed before sampling, between the two transfer steps and after completion of each day of sampling. The average value of the slope for the concentration against response curve was used to calculate the measured (diluted) concentration of the fuel vapor. In addition to the calibration samples, a known high concentration standard was analyzed through the dilution device before, during and after the sampling periods to obtain the average dilution factor. This average factor showed good agreement with the approximate dilution factors obtained from the sample and nitrogen flow meter readings.

Samples of the fuel in both tanks (273 and 275) were analyzed at WPAFB. The data on the specification and distillation range tests are shown in Table 8.

The conversion of the % methane when the tanks are being filled to the emission rate (as methane) in lb/hr is shown in Table 9. For these calculations, it is assumed that the vapor and air above the fuel is at the average vapor temperature and that each gallon of fuel displaced an equal volume of air. The emission rate data are expressed in lb/hr at the standard conditions of 29.92" Hg pressure and 70°F.

In summary, the emission data from the transfer operations indicate that: (1) emissions are greatly reduced when the fuel temperature is lower during cold weather, (2) the pressure-vacuum breather valve has little effect when the liquid fuel is at 70°F, but tends to increase the emissions when the liquid fuel is in the 44-47°F range, and (3) in general the air that enters a recently emptied tank tends to dilute the vapor concentration, however, over a time period, the vapor reaches equilibrium with the liquid displacing some of the dilution air. Based on the test data collected from both the warm weather and cold weather

TABLE 7. CONCENTRATION AND DILUTION FACTORS

Date	Concentration Factor	Experimental Dilution Factor
2/01	2.650	7.018
	3.067	7.020
2/09	0.4443	6.215
	0.5100	5.702
2/16	1.048	4.670
	1.209	4.597
2/27	0.6741	5.138
	0.6912	5.220

Table 8. RESULTS OF WPAFB SPECIFICATION TESTS

FUELS TEST REPORT — DATE COMPLETED: 31 Jan 79

SUBMITTED BY	TEST LABORATORY AND LOCATION	ORIGIN OR CONTRACTOR
2750ABW/DMSFI Wright-Patterson AFB OH	Det 13 SA-ALC/SFQLA/WPAFB OH	

LABORATORY TEST NUMBER	79-F-222	79-F-223	
DATE RECEIVED IN LAB	26 Jan 79	26 Jan 79	
SPECIFICATION NUMBER	MIL-T-5624	MIL-T-5624	
GRADE NUMBER	JP-4	JP-4	
CONTRACT NUMBER	---	---	
QUANTITY REPRESENTED (GALS)	3,817	48,556	
TYPE CONTAINER AND NUMBER	2 x 1 Gal Cans	2 x 1 Gal Cans	
SAMPLE NUMBER	79-118	79-119	
REMARKS (PERTAINING TO SAMPLE AS RECEIVED) Environmental Testing.	Tk Nbr. 273	Tk Nbr. 275	
LABORATORY DATA			
GRAVITY °A.P.I.	54.7	54.9	
WSIM	m.s. 99	m.s. 98	
APPEARANCE			
COLOR			
ODOR			
WATER REACTION	0.0 #1 #1	0.0 #1 #1	
FREEZING POINT °F	Below -72	Below -72	
CORROSION	Negative	Negative	
EXISTENT GUM, MG/100 ML	0.6	1.2	
POTENTIAL GUM, MG/100 ML			
OXIDATION PPT. MG/100 ML			
Hydrogen Wt., %	14.4	14.4	
MERCAPTAN SULFUR, % WT.			
TOTAL SULFUR, % WT.			
VAPOR PRESSURE, P.S.I. @ 100° F	2.7	2.6	
ANILINE POINT °F			
B.T.U.	18,724	18,735	
SMOKE POINT MM	26.9	27.1	
AROMATICS, %	11.1	11.2	
OLEFINS, %	0.3	0.3	
Cond., CU	5	6	
Filtration Time @27	4 Min	4 Min	
KNOCK RATING	LEAN RICH	LEAN RICH	LEAN RICH
TOTAL SOLIDS, MG/GAL	0.1	0.1	
FIBROUS MATERIAL PER/QT			
VISIBLE FREE WATER ML/ Liter	0.0	0.0	
NONCOMBUSTIBLE SOLIDS MG/GAL			
TOTAL WATER, PPM BY VOL BY KARL FISCHER			
THERMAL STABILITY, TUBE DEPOSIT CODE NO.			
THERMAL STABILITY, PRESSURE DIFF. (IN. HG.)			
MIL-I-27686 ICING INHIBITOR, % BY VOL	0.08	0.08	
DISTILLATION	IBP °F 130 167 °F	IBP °F 135 167 °F	IBP °F 167 °F
	10% 190 221	10% 194 221	10% 221
	20% 215 275	20% 217 275	20% 275
	40% 290 52	40% 290 52	40% 290
	50% 286 370 80	50% 288 370 78	50% 370
	90% 412 400 88	90% 425 400 85	90% 400
	10% 50% 470	10% 50% 470 96	10% 50% 470
	E PT. 468 REC 98.0	E PT. 490 REC 98.0	E PT. REC
	RES % 1.0 LOSS 1.0	RES % 1.0 LOSS 1.0	RES % LOSS

REMARKS (PERTAINING TO USABILITY AND DISPOSITION OF MATERIAL)

MATERIAL REPRESENTED BY SAMPLE NO. 79-118 & 79-119 (IS) SATISFACTORY FOR USE

APPROVED BY (NAME AND SIGNATURE OF SUPVR)
THOMAS [illegible]
Chief, Aerospace Fuels Lab
Directorate of Energy Management

AFTO FORM 473 MAR 77 — REPLACES AFTO FORM 68, WHICH WILL BE USED

TABLE 9. CALCULATION OF EMISSION RATE IN METHANE EQUIVALENTS BASED ON TOTAL HYDROCARBON DATA

Date	Transfer From	Transfer To	Avg. THC as Vol. % CH_4	Emissions mg/m^3 (A)	Air Displacement Rate m^3/hr	Emission Rate lb/hr
2/01	275	273	11.0	75,900	77.27	12.9
2/01	273	275	8.0	56,300	90.35	11.2
2/09	275	273	13.8	95,300	78.09	16.4
2/09	273	275	12.4	86,800	88.76	17.0
2/16	275	273	5.1	35,200	78.93	6.1
2/16	273	275	6.4	45,000	76.71	7.6
2/27	275	273	6.8	46,600	78.32	8.1
2/27	273	275	9.3	63,200	87.49	12.2

(A) - Data given at standard condition of 29.92 in. Hg pressure and 70°F

periods, there is no evidence that would indicate that increased ullage space would either increase or decrease the vapor emissions. If this type of information is desired, the emission rate should be measured with various volumes of fuel in the tank, rather than to measure emissions during a filling operation. In general, the data obtained from the warm weather test program indicate that the emission rate is dependent upon the liquid fuel temperature, whereas the cold weather tests indicate that the emissions depend on both the liquid fuel temperature and the position of the pressure vacuum breather valve. At this time, we have no explanation as to why the presence of the breather valve appears to increase the level of the emissions during cold weather filling operations.

SAMPLING PROCEDURES

The storage tank vents were 4" I.D. pipes that run up the side of the pump building and extend about 3 feet above the roof. The vacuum-pressure breather valve was attached to the extreme end of the pipe. The entire breather valve was enclosed with a Mylar film tent, secured to the vent with duct tape. Several openings were cut in the tent to allow the vapors to escape as the tank was filled. A diagram of the apparatus required to sample the vents is shown in Figure 9.

A Type K thermocouple was positioned in the tent so that it would be directly in the vapor stream but away from direct sunlight. The thermocouple extension wire passed through a hole in the Mylar film tent and was connected to a digital thermometer.

The 1/4" O.D. heated Teflon tubing used as sample line was attached to the Mylar film tent with a nylon bulkhead fitting. About six feet of sample line was required to connect the sample tent to the dilution apparatus.

Due to the high concentration of hydrocarbon vapors from the vent, the sample required dilution prior to analysis. The dilution device, which provided about a 5:1 dilution factor, consisted of a sample flow meter, an 18" length of 1/16" O.D. tubing which acted as a flow restrictor, a dilution nitrogen flow meter, a 6" length of 1/8" O.D. tubing to restrict nitrogen flow, a mixing section, and a 60' length of 1/4" copper tubing leading to the sampling valve inlet on the chromatograph. A 1/4" line leads from the sampling valve outlet to an isolation valve and

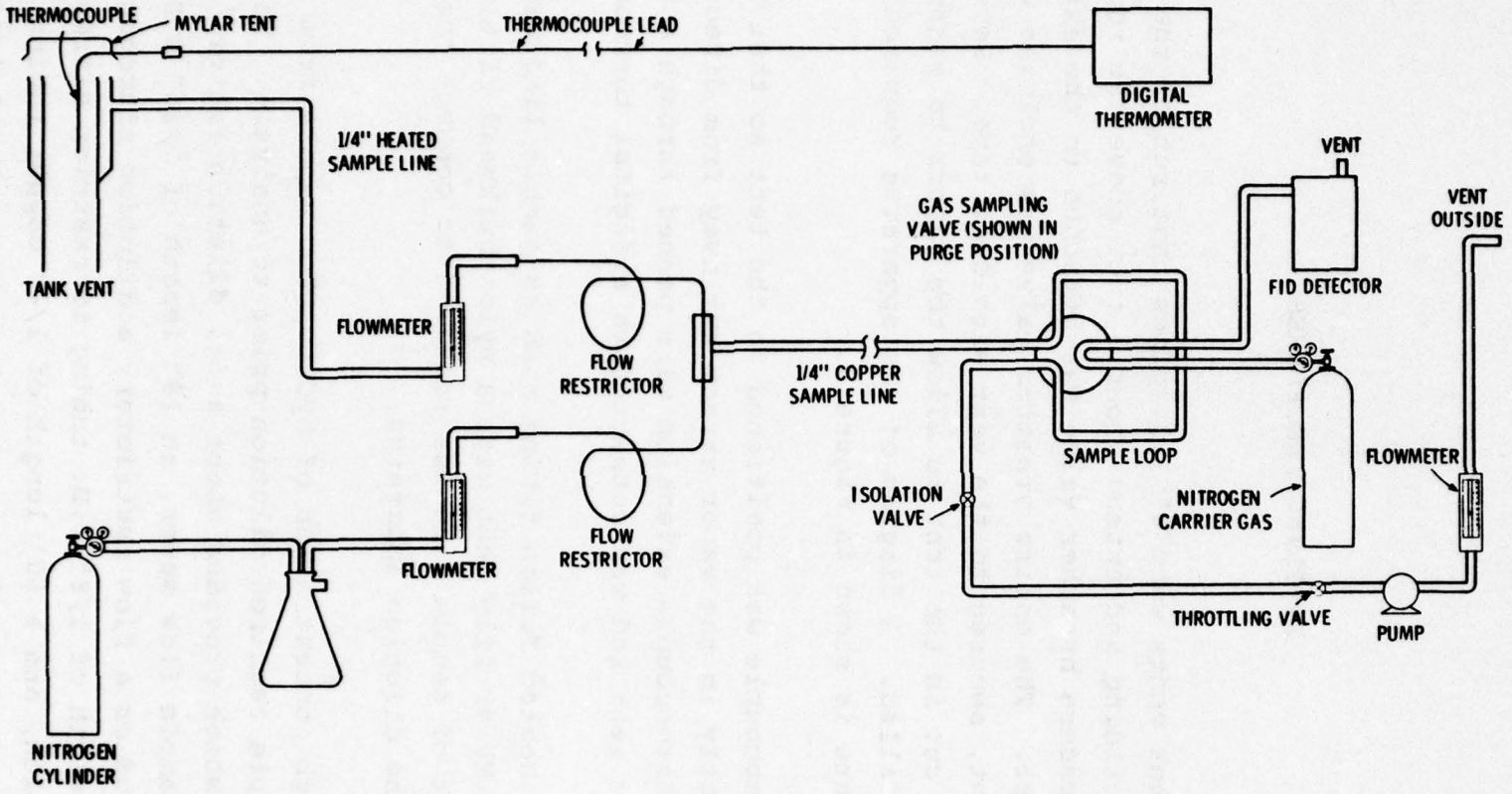

Figure 9. Diagram of the sampling system.

then to a pump, throttling valve and a flow meter. The prepurified nitrogen was fed into a suction flask and out of the suction flask to the dilution device through a two hole stopper. The side arm of the suction flask was left open in order to vent excess nitrogen and thus maintain the supply of nitrogen to the dilution device at one atmosphere pressure.

As a safety measure, the exit line from the sample pump was directed outside the building. During the sampling and analysis program, the air in the room was monitored with a Century Systems OVA 128 hydrocarbon analyzer set to give an audible alarm if the total hydrocarbon concentration in the room increased by 10 ppm. No buildup of vapor in the room was noted during any phase of the program.

ANALYSIS PROCEDURES

The total hydrocarbon concentrations in the diluted fuel was measured by an Analytical Instrument Development Model 511 Portable Gas Chromatograph having a flame ionization detection system.

Prior to the field work, the dilution device was assembled and connected to the chromatograph in order to verify its operation. The lengths and inside diameters of the sample and nitrogen flow limiting lines were adjusted to provide approximately a 5:1 dilution ratio. The operation of the dilutor and the GC instrument were verified with known concentrations of methane in air. A calibration curve was obtained by analyzing various concentrations of methane in air (5-100% methane) after dilution by the dilution device, to determine if the response of the diluted sample was maintained within the linear range of the GC detector.

Prior to each sampling run at WPAFB, the GC response curve was determined by analyzing undiluted methane gas standards. The dilution device was calibrated by: (1) analyzing a high concentration methane standard through the dilution device and, (2) by directly analyzing the same sample. The dilution factor was calculated and compared to the approximate factor obtained by reading the sample and nitrogen flow meters. The determination of the GC response and dilution factors were repeated between the two daily transfer operations and again at the end of each sampling day. An average of the response and dilution factors obtained before and after each run was used to obtain the calculated concentration values.

Day-to-day variations in the GC response and the dilution factor were observed; however, during each sampling day little variation in the detector response or dilution factor was noted.

During transfer operations, data were recorded and samples were diluted and analyzed at two minute intervals. The computer sheets shown in the Appendix summarize the time, attenuation range, peak height, vapor temperature, sample, nitrogen and total flow rates, the measured concentration (diluted) and the actual concentration before dilution for each two minute interval of sampling as well as the information on ambient temperature and pressure, fuel temperature, gallons transferred and calculated fuel flow rates for each run. Data at two minute intervals were used to prepare the curves shown in Figures 1-8 and ten minute intervals for the data summaries.

The total hydrocarbon data were recorded on a strip chart recorder as a sharp peak. After the completion of sampling, the height of each peak was measured and this height was multiplied by the attenuation to provide the response data used in the calculations. The calculations required are as follows:

$$\text{Response} = \text{peak height} \times \text{attenuation}$$

$$\text{Response factor} = \frac{\text{conc. of standard in ppm}}{\text{response of standard}}$$

$$\text{Measured conc. of sample} = \text{response of sample} \times \text{response factor}$$

$$\text{Actual concentration} = \text{measured concentration} \times \text{dilution factor}$$

APPENDIX

COMPUTER PRINTOUT SHEETS SHOWING THE CALCULATED RESULTS FOR TWO MINUTE INCREMENTS OF SAMPLING

TANK 275 TO 273 - 02/01/79

AMBIENT TEMP (DEG F)	19	TANK VOL START (GAL)	2131.
START TIME	1332	TANK VOL FINISH (GAL)	48600.
FINISH TIME	1554	FUEL TRANS (GAL)	46469.
TOT TIME (MINS)	142	FLOW RATE (GAL/MIN)	327.0
BAR PRES (IN HG)	29.38	LIQ TEMP (DEG F)	44

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1332	4	77	38	0.42	3.50	3.92	816.	5728.
1333	4	217	38	0.42	3.50	3.92	2300.	16143.
1334	256	33	38	0.42	3.50	3.92	22387.	157113.
1336	128	67	38	0.42	3.50	3.92	22726.	159494.
1338	128	67	38	0.42	3.50	3.92	22726.	159494.
1340	128	65	38	0.42	3.50	3.92	22048.	154733.
1342	128	65	39	0.42	3.50	3.92	22048.	154733.
1344	128	63	39	0.42	3.50	3.92	21370.	149972.
1346	128	64	40	0.42	3.50	3.92	21709.	152352.
1348	128	63	40	0.42	3.50	3.92	21370.	149972.
1350	128	63	40	0.42	3.50	3.92	21370.	149972.
1352	128	63	40	0.42	3.50	3.92	21370.	149972.
1354	128	60	41	0.42	3.50	3.92	20352.	142830.
1356	128	60	41	0.42	3.50	3.92	20352.	142830.
1358	128	58	41	0.42	3.50	3.92	19674.	138069.
1400	128	57	41	0.42	3.50	3.92	19334.	135689.
1402	128	57	41	0.42	3.50	3.92	19334.	135689.
1404	128	55	40	0.42	3.50	3.92	18656.	130928.
1406	128	55	40	0.42	3.50	3.92	18656.	130928.
1408	128	55	40	0.42	3.50	3.92	18656.	130928.
1410	128	55	40	0.42	3.50	3.92	18656.	130928.
1412	128	54	40	0.37	3.25	3.62	18317.	128547.
1414	128	53	40	0.37	3.25	3.62	17978.	126167.
1416	128	52	40	0.37	3.25	3.62	17638.	123786.
1418	128	52	40	0.37	3.25	3.62	17638.	123786.
1420	128	52	40	0.37	3.25	3.62	17638.	123786.
1422	128	51	40	0.37	3.25	3.62	17299.	121406.
1424	128	51	40	0.37	3.25	3.62	17299.	121406.
1426	128	49	40	0.37	3.25	3.62	16621.	116645.
1428	128	48	40	0.37	3.25	3.62	16282.	114264.
1430	128	47	39	0.37	3.25	3.62	15942.	111884.
1432	128	46	39	0.37	3.25	3.62	15603.	109503.
1434	128	45	40	0.37	3.25	3.62	15264.	107123.
1436	128	44	40	0.37	3.25	3.62	14925.	104742.
1438	128	44	40	0.37	3.25	3.62	14925.	104742.
1440	128	43	40	0.37	3.25	3.62	14586.	102362.
1442	128	42	40	0.37	3.25	3.62	14246.	99981.
1444	128	39	40	0.42	3.50	3.92	13229.	92840.
1446	128	39	40	0.42	3.50	3.92	13229.	92840.
1448	128	38	40	0.42	3.50	3.92	12890.	90459.
1450	128	38	41	0.42	3.50	3.92	12890.	90459.
1452	128	38	41	0.42	3.50	3.92	12890.	90459.
1454	128	38	40	0.42	3.50	3.92	12890.	90459.
1456	128	38	41	0.42	3.50	3.92	12890.	90459.
1458	128	39	42	0.42	3.50	3.92	13229.	92840.
1500	128	38	42	0.42	3.50	3.92	12890.	90459.
1502	128	38	42	0.42	3.50	3.92	12890.	90459.
1504	128	38	42	0.42	3.50	3.92	12890.	90459.
1506	128	38	42	0.42	3.50	3.92	12890.	90459.
1508	128	37	42	0.42	3.50	3.92	12550.	88079.

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1510	128	42	42	0.42	3.50	3.92	14246.	99981.
1512	128	43	42	0.42	3.50	3.92	14586.	102362.
1514	128	42	42	0.42	3.50	3.92	14246.	99981.
1516	128	42	42	0.42	3.50	3.92	14246.	99981.
1518	128	41	42	0.42	3.50	3.92	13907.	97601.
1520	128	40	42	0.42	3.50	3.92	13568.	95220.
1522	128	40	42	0.42	3.50	3.92	13568.	95220.
1524	128	39	42	0.42	3.50	3.92	13229.	92840.
1526	128	39	42	0.42	3.50	3.92	13229.	92840.
1528	128	39	42	0.42	3.50	3.92	13229.	92840.
1530	128	39	42	0.42	3.50	3.92	13229.	92840.
1532	128	40	42	0.42	3.50	3.92	13568.	95220.
1534	128	40	43	0.42	3.50	3.92	13568.	95220.
1536	128	40	42	0.42	3.50	3.92	13568.	95220.
1538	128	40	43	0.42	3.50	3.92	13568.	95220.
1540	128	40	42	0.42	3.50	3.92	13568.	95220.
1542	128	40	42	0.42	3.50	3.92	13568.	95220.
1544	128	40	42	0.42	3.50	3.92	13568.	95220.
1546	128	41	43	0.42	3.50	3.92	13907.	97601.
1548	128	41	42	0.42	3.50	3.92	13907.	97601.
1550	128	40	42	0.42	3.50	3.92	13568.	95220.
1552	128	40	43	0.42	3.50	3.92	13568.	95220.
1554	64	80	42	0.42	3.50	3.92	13568.	95220.
1555	64	65	28	0.42	3.50	3.92	11024.	77366.
1556	64	53	28	0.42	3.50	3.92	8989.	63083.
1557	64	45	28	0.42	3.50	3.92	7632.	53561.
1558	64	39	28	0.42	3.50	3.92	6614.	46420.
1559	64	35	28	0.42	3.50	3.92	5936.	41659.
1600	64	30	28	0.42	3.50	3.92	5088.	35708.
1601	64	29	28	0.42	3.50	3.92	4918.	34517.
1602	64	26	27	0.42	3.50	3.92	4410.	30947.

TANK 273 TO 275 - 02/01/79

AMBIENT TEMP (DEG F)	16	TANK VOL START (GAL)	2456.
START TIME	1700	TANK VOL FINISH (GAL)	49094.
FINISH TIME	1904	FUEL TRANS (GAL)	46638.
TOT TIME (MINS)	124	FLOW RATE (GAL/MIN)	376.0
BAR PRES (IN HG)	29.40	LIQ TEMP (DEG F)	44

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1700	16	47	31	0.48	3.25	3.73	2306.	16191.
1702	8	30	31	0.48	3.25	3.73	736.	5167.
1704	64	66	31	0.48	3.25	3.73	12955.	90944.
1706	64	73	31	0.48	3.25	3.73	14329.	100590.
1708	64	74	31	0.48	3.25	3.73	14525.	101968.
1710	64	73	31	0.48	3.25	3.73	14329.	100590.
1712	64	75	33	0.48	3.25	3.73	14722.	103346.
1714	64	75	33	0.48	3.25	3.73	14722.	103346.
1716	64	74	33	0.48	3.25	3.73	14525.	101968.
1718	64	73	33	0.48	3.25	3.73	14329.	100590.
1720	64	73	33	0.48	3.25	3.73	14329.	100590.
1722	64	74	33	0.48	3.25	3.73	14525.	101968.
1724	64	74	33	0.48	3.25	3.73	14525.	101968.
1726	64	74	33	0.48	3.25	3.73	14525.	101968.
1728	64	72	33	0.48	3.25	3.73	14133.	99212.
1730	64	70	33	0.48	3.25	3.73	13740.	96456.
1732	64	68	34	0.48	3.25	3.73	13348.	93700.
1734	64	65	34	0.48	3.25	3.73	12759.	89566.
1736	64	62	34	0.48	3.25	3.73	12170.	85432.
1738	64	59	33	0.48	3.25	3.73	11581.	81299.
1740	64	55	33	0.47	3.25	3.72	10796.	75787.
1742	64	53	33	0.47	3.25	3.72	10403.	73031.
1744	64	51	33	0.47	3.25	3.72	10011.	70275.
1746	64	51	33	0.47	3.25	3.72	10011.	70275.
1748	64	51	33	0.47	3.25	3.72	10011.	70275.
1750	64	49	33	0.47	3.25	3.72	9618.	67519.
1752	64	48	33	0.47	3.25	3.72	9422.	66141.
1754	64	47	33	0.47	3.25	3.72	9226.	64763.
1756	64	47	33	0.47	3.25	3.72	9226.	64763.
1758	64	47	34	0.47	3.25	3.72	9226.	64763.
1800	64	46	33	0.47	3.25	3.72	9029.	63385.
1802	64	46	33	0.47	3.25	3.72	9029.	63385.
1804	64	47	33	0.47	3.25	3.72	9226.	64763.
1806	64	47	33	0.47	3.25	3.72	9226.	64763.
1808	64	46	33	0.47	3.25	3.72	9029.	63385.
1810	64	47	33	0.47	3.25	3.72	9226.	64763.
1812	64	47	33	0.47	3.25	3.72	9226.	64763.
1814	64	47	33	0.47	3.25	3.72	9226.	64763.
1816	64	48	33	0.47	3.25	3.72	9422.	66141.
1818	64	49	33	0.47	3.25	3.72	9618.	67519.
1820	64	49	33	0.47	3.25	3.72	9618.	67519.
1822	64	50	33	0.47	3.25	3.72	9814.	68897.
1824	64	51	33	0.47	3.25	3.72	10011.	70275.
1826	64	51	33	0.47	3.25	3.72	10011.	70275.
1828	64	52	33	0.47	3.25	3.72	10207.	71653.
1830	64	52	33	0.47	3.25	3.72	10207.	71653.
1832	64	52	33	0.47	3.25	3.72	10207.	71653.
1834	64	52	32	0.47	3.25	3.72	10207.	71653.
1836	64	52	32	0.47	3.25	3.72	10207.	71653.
1838	64	55	32	0.47	3.25	3.72	10796.	75787.

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1840	64	62	32	0.47	3.25	3.72	12170.	85432.
1842	64	65	31	0.47	3.25	3.72	12759.	89566.
1844	64	65	32	0.47	3.25	3.72	12759.	89566.
1846	64	65	31	0.47	3.25	3.72	12759.	89566.
1848	64	73	31	0.47	3.25	3.72	14329.	100590.
1850	64	74	31	0.47	3.25	3.72	14525.	101968.
1852	64	73	31	0.47	3.25	3.72	14329.	100590.
1854	64	72	31	0.47	3.25	3.72	14133.	99212.
1856	64	72	31	0.47	3.25	3.72	14133.	99212.
1858	64	70	31	0.47	3.25	3.72	13740.	96456.
1900	64	69	31	0.47	3.25	3.72	13544.	95078.
1902	64	69	31	0.47	3.25	3.72	13544.	95078.
1904	64	69	30	0.47	3.25	3.72	13544.	95078.
1905	64	64	26	0.47	3.25	3.72	12562.	88188.
1906	64	60	24	0.47	3.25	3.72	11777.	82676.
1907	64	53	22	0.47	3.25	3.72	10403.	73031.
1908	64	47	21	0.47	3.25	3.72	9226.	64763.
1909	64	37	20	0.47	3.25	3.72	7263.	50984.
1910	64	37	19	0.47	3.25	3.72	7263.	50984.
1911	64	33	19	0.47	3.25	3.72	6478.	45472.

TANK 275 TO 273 - 02/09/79

AMBIENT TEMP (DEG F)	11	TANK VOL START (GAL)	2131.
START TIME	1308	TANK VOL FINISH (GAL)	48725.
FINISH TIME	1529	FUEL TRANS (GAL)	46594.
TOT TIME (MINS)	141	FLOW RATE (GAL/MIN)	330.0
BAR PRES (IN HG)	29.48	LIQ TEMP (DEG F)	44

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1308	1280	21	44	0.59	3.50	4.09	11943.	74224.
1309	1280	36	44	0.59	3.50	4.09	20473.	127242.
1310	1280	40	45	0.59	3.50	4.09	22748.	141380.
1312	1280	42	44	0.52	3.50	4.02	23886.	148449.
1314	1280	42	43	0.52	3.50	4.02	23886.	148449.
1316	512	107	42	0.52	3.50	4.02	24341.	151276.
1318	512	108	41	0.52	3.50	4.02	24568.	152690.
1320	512	109	41	0.48	3.25	3.73	24795.	154104.
1322	512	109	41	0.48	3.25	3.73	24795.	154104.
1324	512	109	41	0.48	3.25	3.73	24795.	154104.
1326	512	109	41	0.48	3.25	3.73	24795.	154104.
1328	512	108	42	0.48	3.25	3.73	24568.	152690.
1330	512	107	42	0.48	3.25	3.73	24341.	151276.
1332	512	107	42	0.42	3.00	3.42	24341.	151276.
1334	512	106	42	0.42	3.00	3.42	24113.	149863.
1336	512	106	41	0.42	3.00	3.42	24113.	149863.
1338	512	106	41	0.42	3.00	3.42	24113.	149863.
1340	512	106	41	0.42	3.00	3.42	24113.	149863.
1342	512	103	41	0.42	3.00	3.42	23431.	145621.
1344	512	103	41	0.42	3.00	3.42	23431.	145621.
1346	512	102	42	0.42	3.00	3.42	23203.	144207.
1348	512	102	41	0.42	3.00	3.42	23203.	144207.
1350	512	100	42	0.42	3.00	3.42	22748.	141380.
1352	512	100	41	0.42	3.00	3.42	22748.	141380.
1354	512	101	42	0.42	3.00	3.42	22976.	142794.
1356	512	101	42	0.42	3.00	3.42	22976.	142794.
1358	512	100	41	0.42	3.00	3.42	22748.	141380.
1400	512	100	41	0.42	3.00	3.42	22748.	141380.
1402	512	100	41	0.42	3.00	3.42	22748.	141380.
1404	512	100	41	0.42	3.00	3.42	22748.	141380.
1406	512	100	41	0.42	3.00	3.42	22748.	141380.
1408	512	100	41	0.42	3.00	3.42	22748.	141380.
1410	512	99	41	0.42	3.00	3.42	22521.	139966.
1412	512	99	41	0.42	3.00	3.42	22521.	139966.
1414	512	99	41	0.42	3.00	3.42	22521.	139966.
1416	512	98	41	0.42	3.00	3.42	22293.	138552.
1418	512	98	41	0.42	3.00	3.42	22293.	138552.
1420	512	98	41	0.42	3.00	3.42	22293.	138552.
1422	512	97	41	0.42	3.00	3.42	22066.	137138.
1424	512	97	41	0.42	3.00	3.42	22066.	137138.
1426	512	97	41	0.42	3.00	3.42	22066.	137138.
1428	512	97	41	0.42	3.00	3.42	22066.	137138.
1430	512	97	41	0.42	3.00	3.42	22066.	137138.
1432	512	91	42	0.42	3.00	3.42	20701.	128656.
1434	512	95	42	0.42	3.00	3.42	21611.	134311.
1436	512	94	42	0.42	3.00	3.42	21383.	132897.
1438	512	95	42	0.42	3.00	3.42	21611.	134311.
1440	512	95	42	0.42	3.00	3.42	21611.	134311.
1442	512	94	42	0.42	3.00	3.42	21383.	132897.
1444	512	94	42	0.42	3.00	3.42	21383.	132897.

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1446	512	94	42	0.42	3.00	3.42	21383.	132897.
1448	512	94	42	0.42	3.00	3.42	21383.	132897.
1450	512	93	42	0.42	3.00	3.42	21156.	131483.
1452	512	93	42	0.48	3.25	3.73	21156.	131483.
1454	512	93	42	0.48	3.25	3.73	21156.	131483.
1456	512	93	42	0.48	3.25	3.73	21156.	131483.
1458	512	93	42	0.48	3.25	3.73	21156.	131483.
1500	512	92	41	0.48	3.25	3.73	20928.	130069.
1502	512	92	41	0.48	3.25	3.73	20928.	130069.
1504	512	92	41	0.48	3.25	3.73	20928.	130069.
1506	512	92	41	0.48	3.25	3.73	20928.	130069.
1508	512	92	41	0.48	3.25	3.73	20928.	130069.
1510	512	92	42	0.48	3.25	3.73	20928.	130069.
1512	512	92	42	0.55	3.50	4.05	20928.	130069.
1514	512	91	42	0.55	3.50	4.05	20701.	128656.
1516	512	91	41	0.55	3.50	4.05	20701.	128656.
1518	512	91	42	0.55	3.50	4.05	20701.	128656.
1520	512	91	42	0.55	3.50	4.05	20701.	128656.
1522	512	91	41	0.55	3.50	4.05	20701.	128656.
1524	512	91	41	0.55	3.50	4.05	20701.	128656.
1526	512	0	0	0.55	3.50	4.05	0.	0.
1528	512	0	0	0.55	3.50	4.05	0.	0.
1530	512	91	42	0.55	3.50	4.05	20701.	128656.
1531	512	90	40	0.55	3.50	4.05	20473.	127242.
1532	512	86	39	0.55	3.50	4.05	19563.	121587.
1533	512	81	37	0.55	3.50	4.05	18426.	114518.
1534	512	80	34	0.55	3.50	4.05	18199.	113104.
1535	512	70	34	0.55	3.50	4.05	15924.	98966.
1536	512	64	31	0.55	3.50	4.05	14559.	90483.
1537	512	67	31	0.55	3.50	4.05	15241.	94724.
1538	512	61	30	0.55	3.50	4.05	13876.	86242.
1539	512	64	30	0.55	3.50	4.05	14559.	90483.
1540	512	67	30	0.55	3.50	4.05	15241.	94724.
1541	512	68	31	0.55	3.50	4.05	15469.	96138.

TANK 273 TO 275 - 02/09/79

AMBIENT TEMP (DEG F)	10	TANK VOL START (GAL)	2511.
START TIME	1625	TANK VOL FINISH (GAL)	49150.
FINISH TIME	1831	FUEL TRANS (GAL)	46639.
TOT TIME (MINS)	126	FLOW RATE (GAL/MIN)	370.0
BAR PRES (IN HG)	29.53	LIQ TEMP (DEG F)	44

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1620	256	69	22	0.59	3.75	4.34	9009.	51367.
1621	256	72	21	0.59	3.75	4.34	9400.	53601.
1622	256	66	21	0.59	3.75	4.34	8617.	49134.
1623	256	65	22	0.59	3.75	4.34	8486.	48389.
1624	256	64	23	0.59	3.75	4.34	8356.	47645.
1625	256	68	24	0.59	3.75	4.34	8878.	50623.
1626	256	82	22	0.59	3.75	4.34	10706.	61045.
1628	256	150	28	0.59	3.75	4.34	19584.	111668.
1630	256	160	31	0.59	3.75	4.34	20890.	119112.
1632	256	161	32	0.59	3.75	4.34	21020.	119857.
1634	256	161	32	0.59	3.75	4.34	21020.	119857.
1636	256	161	33	0.59	3.75	4.34	21020.	119857.
1638	256	160	34	0.59	3.75	4.34	20890.	119112.
1640	256	159	33	0.59	3.75	4.34	20759.	118368.
1642	256	157	34	0.59	3.75	4.34	20498.	116879.
1644	256	157	34	0.59	3.75	4.34	20498.	116879.
1646	256	168	35	0.59	3.75	4.34	21934.	125068.
1648	256	166	35	0.59	3.75	4.34	21673.	123579.
1650	256	165	36	0.59	3.75	4.34	21542.	122835.
1652	256	171	36	0.59	3.75	4.34	22326.	127301.
1654	256	168	36	0.58	3.75	4.33	21934.	125068.
1656	256	168	36	0.58	3.75	4.33	21934.	125068.
1658	256	173	37	0.58	3.75	4.33	22587.	128790.
1700	256	174	36	0.58	3.75	4.33	22717.	129535.
1702	256	170	36	0.58	3.75	4.33	22195.	126557.
1704	256	173	36	0.58	3.75	4.33	22587.	128790.
1706	256	176	37	0.58	3.75	4.33	22979.	131024.
1708	256	176	37	0.58	3.75	4.33	22979.	131024.
1710	256	171	38	0.58	3.75	4.33	22326.	127301.
1712	256	169	38	0.58	3.75	4.33	22065.	125813.
1714	256	0	0	0.58	3.75	4.33	0.	0.
1716	256	0	0	0.59	3.75	4.34	0.	0.
1718	256	170	38	0.59	3.75	4.34	22195.	126557.
1720	256	175	38	0.59	3.75	4.34	22848.	130279.
1722	256	173	38	0.59	3.75	4.34	22587.	128790.
1724	256	170	38	0.59	3.75	4.34	22195.	126557.
1726	256	174	38	0.59	3.75	4.34	22717.	129535.
1728	256	172	38	0.59	3.75	4.34	22456.	128046.
1730	256	172	38	0.59	3.75	4.34	22456.	128046.
1732	256	171	38	0.59	3.75	4.34	22326.	127301.
1734	256	172	37	0.59	3.75	4.34	22456.	128046.
1736	256	172	37	0.59	3.75	4.34	22456.	128046.
1738	256	172	37	0.58	3.75	4.33	22456.	128046.
1740	256	173	36	0.58	3.75	4.33	22587.	128790.
1742	256	172	36	0.58	3.75	4.33	22456.	128046.
1744	256	174	35	0.58	3.75	4.33	22717.	129535.
1746	256	173	35	0.58	3.75	4.33	22587.	128790.
1748	256	175	35	0.58	3.75	4.33	22848.	130279.
1750	256	175	36	0.58	3.75	4.33	22848.	130279.
1752	256	174	35	0.58	3.75	4.33	22717.	129535.

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1754	256	174	35	0.58	3.75	4.33	22717.	129535.
1756	256	175	35	0.58	3.75	4.33	22848.	130279.
1758	256	174	35	0.58	3.75	4.33	22717.	129535.
1800	256	172	34	0.58	3.75	4.33	22456.	128046.
1802	256	174	34	0.58	3.75	4.33	22717.	129535.
1804	256	174	34	0.58	3.75	4.33	22717.	129535.
1806	256	175	34	0.44	3.75	4.19	22848.	130279.
1808	256	175	34	0.44	3.75	4.19	22848.	130279.
1810	256	175	34	0.44	3.40	3.84	22848.	130279.
1812	256	174	34	0.44	3.40	3.84	22717.	129535.
1814	256	170	34	0.44	3.40	3.84	22195.	126557.
1816	256	170	34	0.44	3.40	3.84	22195.	126557.
1818	256	167	34	0.44	3.40	3.84	21804.	124324.
1820	256	150	34	0.44	3.40	3.84	19584.	111668.
1822	256	160	34	0.44	3.40	3.84	20890.	119112.
1824	256	166	34	0.44	3.40	3.84	21673.	123579.
1826	256	172	34	0.44	3.40	3.84	22456.	128046.
1828	256	173	34	0.55	3.80	4.35	22587.	128790.
1830	256	168	23	0.55	3.80	4.35	21934.	125068.
1832	256	153	22	0.55	3.80	4.35	19976.	113901.
1833	256	144	21	0.55	3.80	4.35	18801.	107201.
1834	256	125	19	0.55	3.80	4.35	16320.	93057.
1836	256	90	18	0.55	3.80	4.35	11750.	67001.
1837	256	80	18	0.55	3.80	4.35	10445.	59556.
1838	256	70	18	0.55	3.80	4.35	9139.	52112.
1839	256	58	17	0.55	3.80	4.35	7572.	43178.
1840	256	49	17	0.55	3.80	4.35	6397.	36478.
1841	256	43	18	0.55	3.80	4.35	5614.	32011.
1842	256	39	18	0.55	3.80	4.35	5092.	29034.

TANK 275 TO 273 - 02/16/79

AMBIENT TEMP (DEG F)	18	TANK VOL START (GAL)	2131.
START TIME	1122	TANK VOL FINISH (GAL)	48750.
FINISH TIME	1343	FUEL TRANS (GAL)	46619.
TOT TIME (MINS)	141	FLOW RATE (GAL/MIN)	331.0
BAR PRES (IN HG)	29.53	LIQ TEMP (DEG F)	44

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1118	4	24	34	0.58	3.80	4.38	101.	470.
1120	4	91	34	0.58	3.80	4.38	382.	1782.
1122	4	27	34	0.58	3.80	4.38	113.	529.
1125	128	97	35	0.58	3.80	4.38	13016.	60783.
1127	128	98	35	0.58	3.80	4.38	13150.	61410.
1130	128	94	35	0.58	3.80	4.38	12613.	58903.
1132	128	93	35	0.58	3.80	4.38	12479.	58277.
1135	128	89	36	0.58	3.80	4.38	11942.	55770.
1137	128	87	36	0.58	3.80	4.38	11674.	54517.
1140	128	85	37	0.58	3.80	4.38	11406.	53264.
1142	128	84	37	0.58	3.80	4.38	11271.	52637.
1145	128	83	37	0.58	3.80	4.38	11137.	52010.
1147	128	80	38	0.58	3.80	4.38	10735.	50131.
1150	128	80	38	0.58	3.80	4.38	10735.	50131.
1152	128	78	37	0.58	3.80	4.38	10466.	48877.
1155	128	78	38	0.58	3.80	4.38	10466.	48877.
1157	128	77	38	0.58	3.80	4.38	10332.	48251.
1200	128	76	38	0.58	3.80	4.38	10198.	47624.
1202	128	77	38	0.58	3.80	4.38	10332.	48251.
1205	128	77	38	0.51	3.50	4.01	10332.	48251.
1207	128	77	38	0.51	3.50	4.01	10332.	48251.
1210	128	78	38	0.51	3.50	4.01	10466.	48877.
1212	128	79	38	0.51	3.50	4.01	10600.	49504.
1215	128	80	38	0.51	3.50	4.01	10735.	50131.
1217	128	80	38	0.51	3.50	4.01	10735.	50131.
1220	128	81	38	0.51	3.50	4.01	10869.	50757.
1222	128	82	38	0.48	3.40	3.88	11003.	51384.
1225	128	82	38	0.48	3.40	3.88	11003.	51384.
1227	128	81	39	0.48	3.40	3.88	10869.	50757.
1230	128	76	39	0.48	3.40	3.88	10198.	47624.
1232	128	74	39	0.53	3.50	4.03	9929.	46371.
1235	128	74	39	0.53	3.50	4.03	9929.	46371.
1237	128	77	40	0.53	3.50	4.03	10332.	48251.
1240	128	77	40	0.53	3.50	4.03	10332.	48251.
1242	128	79	40	0.53	3.50	4.03	10600.	49504.
1245	128	78	40	0.53	3.50	4.03	10466.	48877.
1247	128	80	40	0.53	3.50	4.03	10735.	50131.
1250	128	80	40	0.53	3.50	4.03	10735.	50131.
1252	128	85	40	0.53	3.50	4.03	11406.	53264.
1255	128	82	39	0.53	3.50	4.03	11003.	51384.
1257	128	82	39	0.53	3.50	4.03	11003.	51384.
1300	128	82	40	0.51	3.40	3.91	11003.	51384.
1302	128	82	39	0.51	3.40	3.91	11003.	51384.
1305	128	83	39	0.51	3.40	3.91	11137.	52010.
1307	128	84	39	0.51	3.40	3.91	11271.	52637.
1310	128	85	39	0.51	3.40	3.91	11406.	53264.
1312	128	86	38	0.51	3.40	3.91	11540.	53890.
1315	128	86	38	0.51	3.40	3.91	11540.	53890.
1317	128	83	38	0.51	3.40	3.91	11137.	52010.
1320	128	80	38	0.51	3.40	3.91	10735.	50131.

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1322	128	78	38	0.51	3.40	3.91	10466.	48877.
1325	128	76	38	0.51	3.25	3.76	10198.	47624.
1327	128	77	38	0.51	3.25	3.76	10332.	48251.
1330	128	75	38	0.51	3.25	3.76	10064.	46997.
1332	128	73	38	0.51	3.25	3.76	9795.	45744.
1335	128	72	37	0.51	3.25	3.76	9661.	45117.
1337	128	74	38	0.50	3.25	3.75	9929.	46371.
1340	128	72	38	0.50	3.25	3.75	9661.	45117.
1342	128	73	38	0.50	3.25	3.75	9795.	45744.
1343	128	73	40	0.50	3.25	3.75	9795.	45744.
1344	128	74	40	0.50	3.25	3.75	9929.	46371.
1345	128	75	41	0.50	3.25	3.75	10064.	46997.

TANK 273 TO 275 - 02/16/79

AMBIENT TEMP (DEG F)	18	TANK VOL START (GAL)	2428.
START TIME	1440	TANK VOL FINISH (GAL)	49233.
FINISH TIME	1708	FUEL TRANS (GAL)	46805.
TOT TIME (MINS)	148	FLOW RATE (GAL/MIN)	316.0
BAR PRES (IN HG)	29.58	LIQ TEMP (DEG F)	44

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1436	32	32	27	0.48	3.20	3.68	1238.	5693.
1438	32	8	27	0.48	3.20	3.68	310.	1423.
1440	32	2	27	0.48	3.20	3.68	77.	356.
1442	128	99	31	0.48	3.20	3.68	15324.	70446.
1444	128	98	32	0.48	3.20	3.68	15169.	69734.
1446	128	96	32	0.48	3.20	3.68	14860.	68311.
1448	128	96	32	0.47	3.25	3.72	14860.	68311.
1450	128	0	0	0.47	3.25	3.72	0.	0.
1452	128	0	0	0.47	3.25	3.72	0.	0.
1454	128	0	0	0.47	3.25	3.72	0.	0.
1456	128	0	0	0.47	3.25	3.72	0.	0.
1458	128	89	33	0.47	3.25	3.72	13776.	63330.
1500	128	93	33	0.47	3.25	3.72	14396.	66176.
1502	128	94	33	0.47	3.25	3.72	14550.	66888.
1504	128	93	33	0.47	3.25	3.72	14396.	66176.
1506	128	95	33	0.47	3.25	3.72	14705.	67599.
1508	128	96	32	0.47	3.25	3.72	14860.	68311.
1510	128	95	32	0.47	3.25	3.72	14705.	67599.
1512	128	95	32	0.47	3.25	3.72	14705.	67599.
1514	128	95	32	0.47	3.25	3.72	14705.	67599.
1516	128	94	32	0.47	3.25	3.72	14550.	66888.
1518	128	94	32	0.47	3.25	3.72	14550.	66888.
1520	128	93	32	0.47	3.25	3.72	14396.	66176.
1522	128	93	32	0.47	3.25	3.72	14396.	66176.
1524	128	92	32	0.47	3.25	3.72	14241.	65465.
1526	128	93	32	0.47	3.25	3.72	14396.	66176.
1528	128	93	32	0.47	3.25	3.72	14396.	66176.
1530	128	93	32	0.47	3.25	3.72	14396.	66176.
1532	128	93	32	0.47	3.25	3.72	14396.	66176.
1534	128	92	31	0.47	3.25	3.72	14241.	65465.
1536	128	92	31	0.47	3.25	3.72	14241.	65465.
1538	128	92	31	0.47	3.25	3.72	14241.	65465.
1540	128	92	31	0.37	3.20	3.57	14241.	65465.
1542	128	92	31	0.37	3.20	3.57	14241.	65465.
1544	128	92	31	0.37	3.20	3.57	14241.	65465.
1546	128	91	31	0.37	3.20	3.57	14086.	64753.
1548	128	92	31	0.37	3.20	3.57	14241.	65465.
1550	128	89	31	0.37	3.20	3.57	13776.	63330.
1552	128	89	31	0.42	3.70	4.12	13776.	63330.
1554	128	89	31	0.42	3.70	4.12	13776.	63330.
1556	128	89	31	0.42	3.70	4.12	13776.	63330.
1558	128	88	31	0.42	3.70	4.12	13622.	62618.
1600	128	88	31	0.42	3.70	4.12	13622.	62618.
1602	128	88	30	0.42	3.70	4.12	13622.	62618.
1604	128	88	30	0.42	3.70	4.12	13622.	62618.
1606	128	87	30	0.42	3.70	4.12	13467.	61907.
1608	128	87	30	0.42	3.70	4.12	13467.	61907.
1610	128	87	30	0.42	3.70	4.12	13467.	61907.
1612	128	86	31	0.42	3.70	4.12	13312.	61195.
1614	128	81	31	0.42	3.70	4.12	12538.	57637.

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1616	128	85	31	0.42	3.70	4.12	13157.	60484.
1618	128	86	31	0.42	3.70	4.12	13312.	61195.
1620	128	86	31	0.42	3.70	4.12	13312.	61195.
1622	128	86	31	0.42	3.70	4.12	13312.	61195.
1624	128	85	31	0.42	3.70	4.12	13157.	60484.
1626	128	85	31	0.42	3.70	4.12	13157.	60484.
1628	128	84	31	0.42	3.70	4.12	13002.	59772.
1630	128	86	31	0.42	3.70	4.12	13312.	61195.
1632	128	85	31	0.42	3.70	4.12	13157.	60484.
1634	128	85	31	0.42	3.70	4.12	13157.	60484.
1636	128	85	30	0.42	3.70	4.12	13157.	60484.
1638	128	85	31	0.42	3.70	4.12	13157.	60484.
1640	128	86	31	0.42	3.70	4.12	13312.	61195.
1642	128	86	30	0.42	3.70	4.12	13312.	61195.
1644	128	85	28	0.42	3.70	4.12	13157.	60484.
1646	128	86	27	0.42	3.70	4.12	13312.	61195.
1648	128	85	25	0.42	3.70	4.12	13157.	60484.
1650	128	85	25	0.42	3.70	4.12	13157.	60484.
1652	128	86	24	0.42	3.70	4.12	13312.	61195.
1654	128	86	23	0.42	3.70	4.12	13312.	61195.
1656	128	86	22	0.42	3.70	4.12	13312.	61195.
1658	128	86	22	0.42	3.70	4.12	13312.	61195.
1700	128	86	21	0.42	3.70	4.12	13312.	61195.
1702	128	87	21	0.42	3.70	4.12	13467.	61907.
1704	128	85	20	0.42	3.70	4.12	13157.	60484.
1706	128	86	20	0.42	3.70	4.12	13312.	61195.
1708	128	86	20	0.42	3.70	4.12	13312.	61195.
1709	128	85	20	0.42	3.70	4.12	13157.	60484.
1710	128	86	20	0.42	3.70	4.12	13312.	61195.
1711	128	85	20	0.42	3.70	4.12	13157.	60484.
1712	128	86	20	0.42	3.70	4.12	13312.	61195.
1713	128	85	20	0.42	3.70	4.12	13157.	60484.
1714	128	87	20	0.42	3.70	4.12	13467.	61907.

TANK 275 TO 273 - 02/27/79

AMBIENT TEMP (DEG F)	34	TANK VOL START (GAL)	2131.
START TIME	1053	TANK VOL FINISH (GAL)	48875.
FINISH TIME	1313	FUEL TRANS (GAL)	46744.
TOT TIME (MINS)	140	FLOW RATE (GAL/MIN)	334.0
BAR PRES (IN HG)	29.33	LIQ TEMP (DEG F)	47

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1049	8	18	31	0.59	3.80	4.39	97.	499.
1051	32	20	31	0.59	3.80	4.39	431.	2217.
1053	32	5	39	0.59	3.80	4.39	108.	554.
1055	128	145	40	0.59	3.70	4.29	12511.	64283.
1057	128	142	40	0.59	3.70	4.29	12252.	62953.
1059	128	144	40	0.59	3.70	4.29	12425.	63840.
1101	128	144	40	0.59	3.70	4.29	12425.	63840.
1103	128	144	41	0.59	3.70	4.29	12425.	63840.
1105	128	144	41	0.59	3.70	4.29	12425.	63840.
1107	128	144	41	0.59	3.70	4.29	12425.	63840.
1109	128	143	41	0.59	3.70	4.29	12339.	63396.
1111	128	145	41	0.59	3.70	4.29	12511.	64283.
1113	128	146	42	0.59	3.70	4.29	12598.	64726.
1115	128	146	42	0.59	3.70	4.29	12598.	64726.
1117	128	145	42	0.59	3.70	4.29	12511.	64283.
1119	128	146	42	0.59	3.70	4.29	12598.	64726.
1121	128	147	42	0.57	3.70	4.27	12684.	65170.
1123	128	146	42	0.57	3.70	4.27	12598.	64726.
1125	128	147	42	0.57	3.70	4.27	12684.	65170.
1127	128	148	42	0.57	3.70	4.27	12770.	65613.
1129	128	147	42	0.57	3.70	4.27	12684.	65170.
1131	128	148	42	0.57	3.70	4.27	12770.	65613.
1133	128	149	42	0.57	3.70	4.27	12856.	66056.
1135	128	149	42	0.57	3.70	4.27	12856.	66056.
1137	128	151	43	0.57	3.70	4.27	13029.	66943.
1139	128	151	43	0.57	3.70	4.27	13029.	66943.
1141	128	152	43	0.57	3.70	4.27	13115.	67386.
1143	128	152	43	0.57	3.70	4.27	13115.	67386.
1145	128	151	43	0.57	3.70	4.27	13029.	66943.
1147	128	152	43	0.57	3.70	4.27	13115.	67386.
1149	128	153	43	0.57	3.70	4.27	13202.	67830.
1151	128	153	43	0.57	3.70	4.27	13202.	67830.
1153	128	160	43	0.57	3.70	4.27	13806.	70933.
1155	128	152	43	0.57	3.70	4.27	13115.	67386.
1157	128	154	43	0.57	3.70	4.27	13288.	68273.
1159	128	154	43	0.57	3.70	4.27	13288.	68273.
1201	128	154	43	0.57	3.70	4.27	13288.	68273.
1203	128	155	43	0.57	3.70	4.27	13374.	68716.
1205	128	154	44	0.57	3.70	4.27	13288.	68273.
1207	128	152	44	0.57	3.70	4.27	13115.	67386.
1209	128	153	44	0.57	3.70	4.27	13202.	67830.
1211	128	153	44	0.64	3.80	4.44	13202.	67830.
1213	128	154	44	0.64	3.80	4.44	13288.	68273.
1215	128	148	44	0.64	3.80	4.44	12770.	65613.
1217	128	152	44	0.64	3.80	4.44	13115.	67386.
1219	128	152	44	0.64	3.80	4.44	13115.	67386.
1221	128	152	44	0.64	3.80	4.44	13115.	67386.
1223	128	152	44	0.64	3.80	4.44	13115.	67386.
1225	128	152	44	0.64	3.80	4.44	13115.	67386.
1227	128	154	44	0.64	3.80	4.44	13288.	68273.

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1229	128	157	44	0.64	3.80	4.44	13547.	69603.
1231	128	158	44	0.64	3.80	4.44	13633.	70046.
1233	128	160	44	0.64	3.80	4.44	13806.	70933.
1235	128	160	44	0.64	3.80	4.44	13806.	70933.
1237	128	161	44	0.64	3.80	4.44	13892.	71376.
1239	128	157	44	0.64	3.80	4.44	13547.	69603.
1241	128	160	44	0.64	3.80	4.44	13806.	70933.
1243	128	161	44	0.64	3.80	4.44	13892.	71376.
1245	128	160	44	0.64	3.80	4.44	13806.	70933.
1247	128	161	44	0.64	3.80	4.44	13892.	71376.
1249	128	161	44	0.64	3.80	4.44	13892.	71376.
1251	128	162	44	0.64	3.80	4.44	13978.	71820.
1253	128	161	44	0.64	3.80	4.44	13892.	71376.
1255	128	163	44	0.64	3.80	4.44	14064.	72263.
1257	128	162	44	0.64	3.80	4.44	13978.	71820.
1259	128	162	44	0.64	3.80	4.44	13978.	71820.
1301	128	162	44	0.64	3.80	4.44	13978.	71820.
1303	128	163	44	0.64	3.80	4.44	14064.	72263.
1305	128	164	43	0.64	3.80	4.44	14151.	72706.
1307	128	165	44	0.64	3.80	4.44	14237.	73150.
1309	128	166	43	0.64	3.80	4.44	14323.	73593.
1311	128	165	43	0.64	3.80	4.44	14237.	73150.
1313	128	165	43	0.64	3.80	4.44	14237.	73150.
1314	128	167	46	0.64	3.80	4.44	14410.	74036.
1315	128	167	46	0.64	3.80	4.44	14410.	74036.
1316	128	118	47	0.64	3.80	4.44	10182.	52313.
1317	128	84	49	0.64	3.80	4.44	7248.	37240.
1318	128	50	49	0.64	3.80	4.44	4314.	22167.
1319	128	36	49	0.64	3.80	4.44	3106.	15960.
1320	128	28	49	0.64	3.80	4.44	2416.	12413.
1321	128	25	49	0.64	3.80	4.44	2157.	11083.

TANK 273 TO 275 - 02/27/79

AMBIENT TEMP (DEG F)	41	TANK VOL START (GAL)	2200.
START TIME	1422	TANK VOL FINISH (GAL)	48956.
FINISH TIME	1627	FUEL TRANS (GAL)	46756.
TOT TIME (MINS)	125	FLOW RATE (GAL/MIN)	374.0
BAR PRES (IN HG)	29.32	LIQ TEMP (DEG F)	47

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1408	128	176	55	0.64	3.80	4.44	15571.	81282.
1412	128	180	56	0.64	3.80	4.44	15925.	83130.
1416	128	181	56	0.64	3.80	4.44	16014.	83592.
1422	128	0	0	0.64	3.80	4.44	0.	0.
1424	128	182	44	0.64	3.80	4.44	16102.	84053.
1426	128	189	44	0.64	3.80	4.44	16722.	87286.
1428	128	188	44	0.64	3.80	4.44	16633.	86824.
1430	128	188	44	0.64	3.80	4.44	16633.	86824.
1432	128	188	44	0.64	3.80	4.44	16633.	86824.
1433	128	189	44	0.64	3.80	4.44	16722.	87286.
1434	128	189	43	0.64	3.80	4.44	16722.	87286.
1436	128	191	43	0.64	3.80	4.44	16898.	88210.
1438	128	192	43	0.64	3.80	4.44	16987.	88672.
1440	128	192	43	0.64	3.80	4.44	16987.	88672.
1442	128	193	43	0.64	3.80	4.44	17075.	89134.
1444	256	97	43	0.64	3.80	4.44	17164.	89595.
1446	256	97	44	0.64	3.80	4.44	17164.	89595.
1448	256	97	44	0.64	3.80	4.44	17164.	89595.
1450	256	97	44	0.64	3.80	4.44	17164.	89595.
1452	256	98	44	0.64	3.80	4.44	17341.	90519.
1454	256	96	44	0.64	3.80	4.44	16987.	88672.
1456	256	99	43	0.64	3.80	4.44	17518.	91443.
1458	256	98	43	0.64	3.80	4.44	17341.	90519.
1500	256	98	43	0.64	3.80	4.44	17341.	90519.
1502	256	99	43	0.64	3.80	4.44	17518.	91443.
1504	256	100	44	0.64	3.80	4.44	17695.	92366.
1506	256	99	43	0.64	3.80	4.44	17518.	91443.
1508	256	99	44	0.64	3.80	4.44	17518.	91443.
1510	256	100	43	0.64	3.80	4.44	17695.	92366.
1512	256	100	43	0.64	3.80	4.44	17695.	92366.
1514	256	100	43	0.64	3.80	4.44	17695.	92366.
1516	256	100	43	0.64	3.80	4.44	17695.	92366.
1518	256	101	43	0.64	3.80	4.44	17872.	93290.
1520	256	101	43	0.64	3.80	4.44	17872.	93290.
1522	256	101	43	0.64	3.80	4.44	17872.	93290.
1524	256	102	43	0.64	3.80	4.44	18049.	94214.
1526	256	102	43	0.64	3.80	4.44	18049.	94214.
1528	256	101	43	0.64	3.80	4.44	17872.	93290.
1530	256	101	43	0.64	3.80	4.44	17872.	93290.
1532	256	101	43	0.64	3.80	4.44	17872.	93290.
1534	256	101	43	0.64	3.80	4.44	17872.	93290.
1536	256	101	43	0.64	3.80	4.44	17872.	93290.
1538	256	102	43	0.64	3.80	4.44	18049.	94214.
1540	256	102	43	0.64	3.80	4.44	18049.	94214.
1542	256	102	43	0.64	3.80	4.44	18049.	94214.
1544	256	102	43	0.64	3.80	4.44	18049.	94214.
1546	256	105	43	0.64	3.80	4.44	18579.	96985.
1548	256	102	43	0.64	3.80	4.44	18049.	94214.
1550	256	102	43	0.64	3.80	4.44	18049.	94214.
1552	256	102	44	0.64	3.80	4.44	18049.	94214.

TIME	ATTN RANGE	PEAK HT	VPR TEMP	SMP FLO	N/2 FLO	TOT FLO	MEAS CONC	ACTUAL CONC
1554	256	102	43	0.64	3.80	4.44	18049.	94214.
1556	256	102	44	0.64	3.80	4.44	18049.	94214.
1558	256	102	44	0.64	3.80	4.44	18049.	94214.
1600	256	102	44	0.64	3.80	4.44	18049.	94214.
1602	256	100	44	0.64	3.80	4.44	17695.	92366.
1604	256	101	44	0.64	3.80	4.44	17872.	93290.
1606	256	102	45	0.64	3.80	4.44	18049.	94214.
1608	256	103	45	0.64	3.80	4.44	18226.	95137.
1610	256	106	45	0.64	3.80	4.44	18756.	97908.
1612	256	106	45	0.64	3.80	4.44	18756.	97908.
1614	256	107	46	0.64	3.80	4.44	18933.	98832.
1616	256	108	46	0.64	3.80	4.44	19110.	99756.
1618	256	109	46	0.64	3.80	4.44	19287.	100679.
1620	256	110	46	0.64	3.80	4.44	19464.	101603.
1622	256	111	46	0.64	3.80	4.44	19641.	102527.
1624	256	112	46	0.64	3.80	4.44	19818.	103450.
1626	256	117	46	0.64	3.80	4.44	20703.	108069.
1628	256	113	47	0.64	3.80	4.44	19995.	104374.
1630	256	99	49	0.64	3.80	4.44	17518.	91443.
1631	256	23	49	0.64	3.80	4.44	4070.	21244.
1632	256	18	49	0.64	3.80	4.44	3185.	16626.
1633	256	15	49	0.64	3.80	4.44	2654.	13855.
1634	256	15	49	0.64	3.80	4.44	2654.	13855.